AR201-13610B

The Flavor and Fragrance High Production Volume Consortia

The Terpene Consortium

Robust Summaries for Bicyclic Terpene Hydrocarbons

alpha-Pinene	CAS No. 80-56-8
beta-Pinene	CAS No. 127-91-3
Camphene	CAS No. 79-92-5
cis-Pinane	CAS No. 6876-13-7
Dihydropinene	CAS No. 473-55-2
l-alpha-Pinene	CAS No. 7785-26-4
Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene	CAS No. 65996-96-5
Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene	CAS No. 65996-97-6
Turpentine gum	CAS No. 9005-90-7
Turpentine oil	CAS No. 8006-64-2

FFHPVC Terpene Consortium Registration Number [redacted]

Submitted to the EPA under the HPV Challenge Program by:
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List of Member Companies

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The evaluation of the quality of the following data uses a systematic approach described by Klimisch [Klimisch *et al*., 1996]. Based on criteria relating to international testing standards for categorizing data reliability, four reliability categories have been established. The following categories are:

- Reliability code 1. Reliable without restrictions
- Reliability code 2. Reliable with restrictions
- Reliability code 3. Not reliable
- Reliability code 4. Not assignable

1 Chemical and Physical Properties

1.1 Melting Point

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Measured
GLP	No
Melting Point	-55 °C
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
GLP	No
Melting Point	-55 °C

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are estimated based on a closely related material, *alpha*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	ASTM E 328-79(89)
Melting Point	45 - 47 °C
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from an acceptable standardized test method.
References	Hoechst AG (1991a) Product information Camphen der Abt. Marketing Chemikalien. Unpublished Report.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	Measured
Remarks for Test Conditions	Substance supported under SIDS.
GLP	No
Melting Point	51-52 °C
Sublimation	Yes
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	Measured
GLP	No

Melting Point	-53 °C
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	Measured
GLP	No
Melting Point	-53 °C
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The substance would be expected to have virtually identical physical properties to *cis*-pinane.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	Measured
GLP	No
Melting Point	-55 °C
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The substance would have identical physical properties to *alpha*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Method/guideline	Measured
Remarks for Test Conditions	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
GLP	No
Melting Point	-55 °C
Decomposition	No
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The substance would be expected to have very similar physical properties to *alpha*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Method/guideline	Measured
Remarks for Test Conditions	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta* phellandrene, 0-2% terpinolene
GLP	No
Melting Point	-55 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Method/guideline	Measured
Remarks for Test Conditions	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.).
GLP	No

Melting Point	-55 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Method/guideline	Measured
Remarks for Test Conditions	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
GLP	No
Melting Point	-55 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

1.2 Boiling Point

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Measured
Boiling Point	155-156 °C
Pressure	760
Pressure Unit	mm
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.

References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	Measured
GLP	No
Boiling Point	165-166 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	DIN 51751
Remarks for Substance	Technical grade
Boiling Point	156.5 - 159 °C
Pressure Unit	101.3 kPa (760 mm Hg)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from an acceptable standardized test method.
References	Hoechst AG (1991a) Product information Camphen der Abt. Marketing Chemikalien. Unpublished Report.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	Measured
GLP	No
Remarks for Substance	Substance supported under SIDS.
Boiling Point	158.5-159.5 °C

Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	Measured
GLP	No
Boiling Point	169 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	Measured
GLP	No
Boiling Point	164.5-165 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	CRC Handbook of Chemistry and Physics (1986) 67th edition, Robert C. Weast, editor, The Chemical Rubber Co Press, Inc. Boca Raton, Florida.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	Measured
GLP	No
Boiling Point	155-156 °C
Pressure	760
Pressure Unit	mm
Decomposition	No
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Method/guideline	Measured
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Boiling Point	155-156 °C
Pressure	760
Pressure Unit	mm
Decomposition	No
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*-pinene.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Method/guideline	Measured
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene

Boiling Point	165-166 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *beta*-pinene.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Method/guideline	Measured
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Boiling Point	155-156 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Method/guideline	Measured
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Boiling Point	155-156 °C
Pressure	760
Pressure Unit	mm
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained from a recognized source and are considered reliable. The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.

References	Merck Index (1996) 12th edition, Susan Budavari, editor, Merck & Co. Inc. Whitehouse Station, NJ.

1.3 Vapor Pressure

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.55 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.35 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	Dynamic Method
GLP	Yes
Year	1991
Vapor Pressure	3.8 kPa at 20 °C and 40 kPa at 62.1°C

Temperature	62.1 °C
Decomposition	No
Conclusion Remarks	The vapor pressure was 40.0 and 901.1 kPa at 62.1 and 154.3 °C, respectively. Calculated values of vapor pressure were 3.8 and 22.2 kPa at 20 and 50 °C, respectively.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from an acceptable standardized test method.
References	Hoechst AG (1991b) Unveroeffentlichte Untersuchung (S91/484).

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	Dynamic Method
GLP	Yes
Year	1990
Vapor Pressure	2.4 kPa
Temperature	20 °C
Decomposition	No
Conclusion Remarks	The vapor pressure was 40.0 and 901.1 kPa at 62.1 and 154.3 °C, respectively. Calculated values of vapor pressure were 3.8 and 22.2 kPa at 20 and 50 °C, respectively.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from an acceptable standardized test method.
References	Hoechst AG (1990) Sicherheitsdatenblatt Camphen (06.07.1990)

Substance Name	*alpha*-Pinene – Data for structurally related substance *delta*-3-Carene
CAS No.	80-56-8
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.35 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.

References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.24 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.29 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Dihydropinene – Data for structurally related substance *cis*-Pinane
CAS No.	473-55-2
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.29 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.55 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical structure.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.55 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical mixture.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% Dipenetene, 1-2% Camphene, 1-3% *beta*-Phellandrene, 0-2% Terpinolene
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.35 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical mixture.

References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.55 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical mixture.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	Mean of Antoine & Grain methods, calculated
Vapor Pressure	0.55 kPa
Temperature	25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR calculation and are consistent with chemical mixture.
References	Meylan W. (1994-1995c) MPBP, Syracuse Research Corporation.

1.4 n-Octanol/Water Partition Coefficient

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Sample consisted mainly of *alpha*-pinene with some camphene, *beta*-pinene and *delta*-3-carene. It was a 50/50 mixture from each of 2 suppliers.

Method/guideline	OECD Guideline 117
GLP	Yes
Year	1993
Log Pow	5.3, 5.5, 5.7
Temperature	35 °C
Conclusion Remarks	The data are for the three components in 3-carene at pH 7.5 with log Pow higher than 1.5. At pH 2.0, there were two components with log Kow of 5.3 and 5.6.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	No analytical data on identity of components presented.
References	Dybdahl, H.P. (1993a) Determination of log Pow for single components in *alpha*-pinene. Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Measured
Year	1995
Log Pow	4.83
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data are from the Syracuse Research Corporation database.
References	Li J. and Perdue, E.M. (1995) Syracuse Research Corporation.

Substance Name	*alpha*-Pinene – Data for structurally related substance *delta*-3-Carene
CAS No.	80-56-8
Remarks for Substance	Test substance was 3-carene, which was reported by the authors to consist of *delta*-3-carene mixed with *alpha*-pinene, *beta*-pinene, and dipentene.
Method/guideline	OECD Guideline 117
GLP	Yes
Year	1993
Log Pow	4.6, 5.2, 5.3, 5.5
Temperature	35 °C
Conclusion Remarks	The data are for the four components in 3-carene at pH 7.5 with log Pow higher than 1.5. At pH 2.0, there were four components

	log Pow higher than 1.5. At pH 2.0, there were four components with log Kow of 4.5, 5.2, 5.3, and 5.5.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	No analytical data on identity of components presented.
References	Dybdahl H.P. (1993b) Determination of log Pow for single components in 3-carene. Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Kowwin calculation
Log Pow	4.27
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	Kowwin calculation
Log Pow	4.35
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	Kowwin calculation
Log Pow	4.35
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.

References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	Kowwin calculation
Log Pow	4.35
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	Kowwin calculation
Log Pow	4.35
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	Kowwin calculation
Log Pow	4.83
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene.

Method/guideline	Kowwin calculation
Log Pow	4.83
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Method/guideline	Kowwin calculation
Log Pow	4.35
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Method/guideline	Kowwin calculation
Log Pow	4.83
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	Kowwin calculation

Log Pow	4.83
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995a) LOGKOW, Syracuse Research Corporation.

1.5 Water Solubility

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	98% pure 1R(+)-isomer. Measured purity 91%
Method/guideline	Liquid-liquid equilibrium
GLP	No
Year	1990
Value (mg/L) at Temperature	0.65 mg/L at 25 °C
pH value and concentration at temperature	7.70
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study.
References	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	99% pure 1S(-)-isomer. Measured purity 97%
Method/guideline	Liquid-liquid equilibrium
GLP	No
Year	1990
Value (mg/L) at Temperature	2.1 mg/L at 25 °C
pH value and concentration at temperature	7.6
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.

Remarks for Data Reliability	Comparable to guideline study.
References	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	Determination of the solubility in water according to Method 84/449/EWG, Anhang V, and A.Teil.
Year	1991
Value (mg/L) at Temperature	4.2 mg/l at 20 °C
pH value and concentration at temperature	5.5 at 22 °C
Conclusion Remarks	The solubility of technical grade camphene in water at 20 °C is 4.2 mg/L. Camphene is considered to be insoluble in water at 20 °C.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained from an acceptable standardized test method.
References	Hoechst AG (1991c) Unveroeffentlichte Untersuchung, Analytisches Laboratorium. (Nr. 229-91(B))

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	WSKOW calculation
Value (mg/L) at Temperature	1.89 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	WSKOW calculation
Value (mg/L) at Temperature	4.89 mg/L at 25 °C

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	WSKOW calculation
Value (mg/L) at Temperature	3.52 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	WSKOW calculation
Value (mg/L) at Temperature	6.01 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	WSKOW calculation
Value (mg/L) at Temperature	4.73 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	WSKOW calculation
Remarks for Test Conditions	The data would be the same as for *alpha*-pinene.
Value (mg/L) at Temperature	1.89 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Method/guideline	WSKOW calculation
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*-pinene.
Value (mg/L) at Temperature	0.65 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Method/guideline	WSKOW calculation
Remarks for Test Conditions	The data are considered to be essentially the same as for *beta*-pinene.
Value (mg/L) at Temperature	2.1 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Method/guideline	WSKOW calculation
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Value (mg/L) at Temperature	1.1 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	WSKOW calculation
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Value (mg/L) at Temperature	1.1 mg/L at 25 °C
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
References	Meylan W. (1993-1995b) WSKOW, Syracuse Research Corporation.

2 Environmental Fate and Pathways

2.1 Photodegradation

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	1.4 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	2.2 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	2.2 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	9.4 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured the OH rate constant for *trans*-pinane.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	9.4 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured the OH rate constant for *trans*-pinane.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	1.4 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	1.4 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	2.2 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	1.7 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	AOPWIN
Test Type	Calculated
Halflife t1/2	1.7 hrs
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are based upon measured OH, ozone and NO3 rate constants.
References	Meylan W. (1994-1995b) AOPWIN, Syracuse Research Corporation.

2.2 Biodegradation

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	> 99% pure
Test Type	Closed Bottle Test
GLP	No
Year	1996
Contact Time	30 days
Innoculum	Soil extracts prepared from samples collected from coniferous (A) and mixed hardwood forest (B) watersheds.
Remarks for Test Conditions	Sealed flasks containing oxygen-saturated media were preconditioned with concentration of 0.5-3.0 mg/L of *alpha*-pinene for 24 hours. Soil extracts A or B were added and the solution was stirred for 30 days in the dark at 23 °C. At regular intervals samples were removed and analyzed for terpene and CO2. In a second experiment, O2-saturated minimum media and hydrocarbon were incubated with innoculum withdrawn from the terpene-fed reactor used in the previous experiment. These solutions were incubated as listed above. Azide-amended solutions were used as controls.

Degradation % After Time	100% at 170 hours
Results	Compared to azide-amended controls, *alpha*-pinene was completely biodegraded in unacclimated and acclimated soil A and B extracts within 30 days. In unacclimated and acclimated soil A extract, lag times of 200 and 98 hours, respectively were recorded.
Kinetic	Maximum degradation rate = 0.039 mg/L x hr (unacclimated) or 0.63 mg/L x hr (acclimated)
10 day Window Criteria	Yes
Total degradation	100% within 170 hours
Classification	Completely biodegradable
Remarks Results	Degradation of pinene was not measurable in azide-treated innoculum, thus the activity of the innoculum was verified and the test was considered valid. *alpha*-Pinene did not exhibit any toxic effects to the microorganisms at the concentration tested.
Conclusion Remarks	The test substance, *alpha*-pinene, underwent 100% biodegradation after approximately 7 days under the test conditions. Biodegradation in unacclimated medium started on day 8 and reached 100% at the end of the day 15. In acclimated soil extract, 100 % degradation occurred within 8 days. The authors concluded the pinene is completely degradable in extracts prepared from watershed soils of coniferous or deciduous forests.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The experiments did not comply with standardized test guidelines. They were part of a comprehensive study of the biodegradation of pinene in forest soil regimens. The experimental techniques and methods of analysis were exhaustive.
Reference	Misra G., Pavlostathis S. G., Perdue E. M., and Araujo R. (1996) Aerobic biodegradation of selected monoterpenes. Applied Microbiology and Biotechnology, 45, 831-838.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	98.6% pure by GC; almost colorless liquid; density 0.858 g/ml at 20 °C
Method/guideline	OECD Guideline 301F
Test Type	Manometric Respirometry Test
GLP	Yes
Year	1998
Contact Time	28 days
Innoculum	Activated sludge, fresh

Remarks for Test Conditions	Followed OECD Guideline 301F. The reference substance used was sodium benzoate. The concentration of test substance used was 100 mg/l and the test temperature was 22 °C.
Degradation % After Time	38% degradation after 28 days
Results	The % degradation (mean of 2 identical flasks) after 3 days is 17%; 5 days is 23%; 7 days is 26%; 13 days is 34%; 21 days is 36% and 28 days is 38%.
10 day Window Criteria	34% at the end of the 10 day window (days 3-13)
Total degradation	38% after 28 days
Classification	Not readily biodegradable
Remarks Results	Averages of 2 identical flasks were used to determine the results. Degradation of sodium benzoate exceeded 40% after 7 days and 65% after 14 days, thus the activity of the innoculum was verified and the test was considered valid. *alpha*-Pinene did not exhibit any toxic effects to the micro-organisms at the concentration tested.
Conclusion Remarks	The test substance, *alpha*-pinene, underwent 38% biodegradation after 28 days under the test conditions. Biodegradation started on day 3 and reached only 34% at the end of the 10-day window. The authors commented that although the test was generally recognized as being applicable to volatile substances, the rather high vapor pressure and low water solubility might have created a loss of test substance in the test medium, which resulted in low results. The authors of the test did not consider the test definitive.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Rudio J. (1999b) Ready biodegradability of pinene *alpha* according to OECD Guideline 301F. Private communication to FFHPVC.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	98.6% pure by GC; almost colorless liquid; density 0.858 g/ml at 20 °C
Method/guideline	OECD Guideline 302C
Test Type	Manometric Respirometry Test
GLP	Yes
Year	1999
Contact Time	31 days
Innoculum	Activated sludge, fresh

Remarks for Test Conditions	Followed OECD Guideline 302C. The reference substance used was sodium benzoate. The concentration of test substance used was 30 mg/l. The test temperature was 25 °C.
Degradation % After Time	37% degradation after 31 days
Results	The % degradation (mean of 2 identical flasks) after 5 days is 9%; 7 days is 12%; 14 days is 34%; 21 days is 35%; 28 days is 37% and 31 days is 37%.
Time required for 10% degradation	5-7 days
Total degradation	37% after 31 days
Classification	Not inherently but partially biodegradable
Remarks Results	Averages of 2 identical flasks were used to determine the results. Degradation of sodium benzoate was 68% after 7 days and 94% after 14 days, which exceeded the validity criterion, thus the activity of the innoculum was verified and the test was considered valid.
Conclusion Remarks	The test substance, *alpha*-pinene, underwent 37% biodegradation after 31 days under the test conditions. The authors commented that the low biodegradation percentage may be attributed to the high vapor pressure and low water solubility of the substance leading to volatilization of the test substance in the upper parts of the test vessel.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Rudio J. (1999a) Inherent biodegradability of pinene *alpha* according to OECD Guideline 302C. Private communication.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test substance reported to have consisted mainly of *alpha*-pinene mixed with camphene, *beta*-pinene and *delta*-3-carene
Method/guideline	OECD Guideline 301D
Test Type	Closed Bottle Test
GLP	Yes
Year	1981
Contact Time	7, 14, 21, 28 days
Innoculum	Secondary effluent
Remarks for Test Conditions	The test medium was initially aerated to an oxygen concentration of 9 mg oxygen/L and inoculated with 1 drop of secondary effluent per liter. The test product was added at 2.5 mg/L to a part of the inoculated test medium, equivalent to a chemical oxygen demand of 5.97 mg oxygen/L. A reference compound was used. Test product and reference compound

	were added to the inoculated medium to evaluate any inhibitory effects. Blank controls were also used. After all additions, the medium was transferred to calibrated respirometric bottles (BOD bottles). The test bottles were kept in the dark at a constant temperature of 20 °C. Triplicate sets of test bottles were sacrificed at the start of the experiment and after 7, 14, 21, and 28 days for oxygen measurements. The oxygen demand was calculated as the difference between measured oxygen concentrations at time t and at the start of the test. The biological oxygen demand for the added carbon sources was calculated by subtracting the oxygen demand in the blank controls from the oxygen demand in the bottles containing the test and reference compounds.
Degradation % After Time	Mean percentage values: 7 days-3.1; 14 days-3.1; 21 days-5.7; 28 days-2.2
Results	The test medium was initially aerated to an oxygen concentration of 9 mg oxygen/L and inoculated with 1 drop of secondary effluent per liter. The test product was added at 2.5 mg/L to a part of the inoculated test medium, equivalent to a chemical oxygen demand of 5.97 mg oxygen/L. A reference compound was used. Test product and reference compound were added to the inoculated medium to evaluate any inhibitory effects. Blank controls were also used. After all additions, the medium was transferred to calibrated respirometric bottles (BOD bottles). The test bottles were kept in the dark at a constant temperature of 20 °C. Triplicate sets of test bottles was sacrificed at the start of the experiment and after 7, 14, 21, and 28 days for oxygen measurements. The oxygen demand was calculated as the difference between measured oxygen concentrations at time t and at the start of the test. The biological oxygen demand for the added carbon sources was calculated by subtracting the oxygen demand in the blank controls from the oxygen demand in the bottles containing the test and reference compounds.
Remarks Results	The biological oxygen demand for *alpha*-pinene was 3.1% and 2.2% of the theoretical oxygen demand after 7 and 28 days respectively. No inhibitory effects of *alpha*-pinene were observed.
Conclusion Remarks	Not readily biodegradable
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Madsen T. (1993a) Biodegradation of *alpha*-pinene. Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	> 99% pure
Method/guideline	Closed Bottle Test

GLP	No
Year	1996
Contact Time	30 days
Innoculum	Soil slurries prepared from samples collected from coniferous (A) and mixed hardwood forest (B) watersheds.
Remarks for Test Conditions	Sealed flasks containing of soil slurry deactivated by autoclave heating were treated with sodium azide and a mixture of 4 hydrocarbons including *alpha*-pinene in the dark at 23 C. At regular intervals the solutions were extracted with isooctane and analyzed for terpene. Subsequently, O2-saturated minimum media and hydrocarbon (0.6 mg/tube) were incubated with a 20% soil slurry. CO2 and terpene concentrations were measured by gas chromatography.
Degradation % After Time	100% within 120 hours
Results	Compared to azide-amended controls, *alpha*-pinene was completely biodegraded by soil slurries A or B extracts within 6 days. The maximum rate of biodegradation 3.3 mg/L x hr tested as a mixture and 5.2 mg/L x hr for pinene itself.
Kinetic	Maximum degradation rate = 5.2 mg/L x hr
Time required for 10% degradation	< 20 hours
10 day Window Criteria	Yes
Total degradation	100% within 120 hours
Classification	Completely biodegradable
Remarks Results	Degradation of pinene was not measurable in azide-treated innoculum, thus the activity of the soil slurry was verified and the test was considered valid.
Conclusion Remarks	The test substance, *alpha*-pinene, underwent 100% biodegradation after approximately 6 days under the test conditions. The authors concluded the pinene is completely degradable in extracts prepared from watershed soils of coniferous or deciduous forests.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The experiments did not comply with standardized test guidelines. They were part of a comprehensive study of the biodegradation of pinene in forest soil regimens. The experimental techniques and methods of analysis were exhaustive.
Reference	Misra G., Pavlostathis, S. G., Perdue, E. M., and Araujo, R. (1996) Aerobic biodegradation of selected monoterpenes. Applied Microbiology and Biotechnology, 45, 831-838.

Substance Name	*alpha*-Pinene – Data for structurally related substance *delta*-3-Carene
CAS No.	80-56-8

Remarks for Substance	Test substance was 3-carene which was reported to consist mainly of *delta*-3-carene mixed with *alpha*-pinene, *beta*-pinene and dipentene
Method/guideline	OECD Guideline 301D
Test Type	Closed Bottle Test
GLP	Yes
Year	1981
Contact Time	7, 14, 21, 28 days
Innoculum	Secondary effluent
Remarks for Test Conditions	The test medium was initially aerated to an oxygen concentration of 9 mg oxygen/L and inoculated with 1 drop of secondary effluent per liter. The test product was added at 7.8 mg/L to a part of the inoculated test medium, equivalent to a chemical oxygen demand of 4.80 mg oxygen/L. A reference compound was used. Test product and reference compound were added to the inoculated medium to evaluate any inhibitory effects. Blank controls were also used. After all additions, the medium was transferred to calibrated respirometric bottles (BOD bottles). The test bottles were kept in the dark at a constant temperature of 20 °C. Triplicate sets of test bottles were sacrificed at the start of the experiment and after 7, 14, 21, and 28 days for oxygen measurements. The oxygen demand was calculated as the difference between measured oxygen concentrations at time t and at the start of the test. The biological oxygen demand for the added carbon sources was calculated by subtracting the oxygen demand in the blank controls from the oxygen demand in the bottles containing the test and reference compounds.
Degradation % After Time	Mean values:7 days- 6.3; 14 days- 17.4; 21 days-1.3; 28 days-3
Results	The reference compound, sodium benzoate, was more than 60% degraded within the first seven days of the test period and thus was considered to have satisfactory activity.
Remarks Results	The biological oxygen demand for 3-carene was 6.3% and 3.8% of the theoretical oxygen demand after 7 and 28 days, respectively. The higher oxygen consumption observed in two replicates at day 14 was attributed by the authors to an inhomogeneous partition of product or a result of biological variation in the test bottles. No inhibitory effects of 3-carene were observed.
Conclusion Remarks	Not readily biodegradable
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Madsen T. (1993b) Biodegradation of 3-carene. Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	DIN 38409, part 52, Guideline 79/1831/EEC©
Test Type	Aerobic
GLP	Yes
Year	1988
Innoculum	Activated sludge, domestic
Total degradation	< 20 % after 28 day(s)
Conclusion Remarks	The test substance, camphene, underwent 20% biodegradation after 28 days under the test conditions. The low biodegradation percentage may be attributed to the high vapor pressure and low water solubility of the substance leading to volatilization of the test substance in the upper parts of the test vessel.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Hoechst AG (1988a) Unveroeffentlichte Untersuchung (V 88.0514).

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Test substance was composed of 50.9% *alpha*-pinene and 36.8% beta-pinene
Method/guideline	Modified EU CO2 evolution test and OECD 301B Guideline
Test Type	28-day ready biodegradability test
GLP	Yes
Year	2001
Contact time (units)	28 days
Innoculum	Secondary effluent obtained from laboratory rolling tube unit fed by 100% settled sewage from Newton Abbot sewage treatment works
10 day window criteria	No
Time required for 10% degradation	3 days
Degradation % after time	52% after 28 days
Results	The reference substance, aniline underwent 78% biodegradation after 28 days. The test substance, gum

	turpentine, was 13% biodegraded after 4 days, 37% after 7 days, and 52% after 28 days.
Remarks for Test Conditions	Sealed bottles containing 95 ml of inoculated medium (OECD 301B), 2.27 mg test substance, 5 ml deionized water were incubated for 28 days at 20.0 C while being shaken at 150 rpm. The reference material (aniline) was used at a test concentration of 20 mg/L. Blank controls were also used. Experiments were performed in triplicate. At 4,7, 14, 20, and 28 days, inorganic carbon (carbon dioxide) was analyzed.
Conclusion Remarks	Gum turpentine was considered to be inherently biodegradable in that the test substance did not reach a plateau of biodegradation at day 28
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	GLP study conducted according to OECD guidelines.
Reference	Long K. W. J. (2001b) Gum turpentine: Determination of 28-day ready biodegradability (Closed Bottle Sturm Test). Report No. BI7034/B. Unpublished report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	BIOWIN
Test Type	Calculated
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical structure.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Method/guideline	BIOWIN
Test Type	Calculated
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical mixture.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Method/guideline	BIOWIN
Test Type	Calculated
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.

Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical mixture.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.).
Method/guideline	BIOWIN
Test Type	Calculated
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical mixture.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	BIOWIN
Test Type	Calculated
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Results	Probability of rapid biodegradation - linear model 0.50 - nonlinear 0.34. Expert survey results - ultimate, weeks to months; primary, days to weeks.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are from a recognized SAR calculation and are consistent with chemical mixture.
Reference	Meylan W. (1994a) BIOWIN, Syracuse Research Corporation.

2.3 Fugacity

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Sediment
Estimated Distribution and Media Concentration	.019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Air-Water Partition Coefficient
Absorption coefficient	13.97
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Aerosol
Estimated Distribution and Media Concentration	.000019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Suspended Sediment
Estimated Distribution and Media Concentration	.00059%

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Soil
Estimated Distribution and Media Concentration	0.85%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP

Media	Water
Estimated Distribution and Media Concentration	.014%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Air
Estimated Distribution and Media Concentration	99.12%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9479
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Fish-Water Partition Coefficient
Absorption coefficient	3380
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.

Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	8316
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Sediment-Water Partition Coefficient
Absorption coefficient	2661
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene

CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Soil-Water Partition Coefficient
Absorption coefficient	1330
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Fish
Estimated Distribution and Media Concentration	.000048%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Sediment-Water Partition Coefficient
Absorption coefficient	881
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Water
Estimated Distribution and Media Concentration	0.03%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Fish
Estimated Distribution and Media Concentration	0.00003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0004%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Sediment

Estimated Distribution and Media Concentration	0.01%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Soil
Estimated Distribution and Media Concentration	0.53%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I

Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Air
Estimated Distribution and Media Concentration	99.4%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9080
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	2750
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Soil-Water Partition Coefficient
Absorption coefficient	441
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3

Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Air-Water Partition Coefficient
Absorption coefficient	7.43
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, water solubility, estimated MP, log Kow
Media	Fish-Water Partition Coefficient
Absorption coefficient	1120
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Soil
Estimated Distribution and Media Concentration	0.53%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	5020
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental

	models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol
Estimated Distribution and Media Concentration	0.00001%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Fish
Estimated Distribution and Media Concentration	0.00003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0004%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment
Estimated Distribution and Media Concentration	0.01%

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air-Water Partition Coefficient
Absorption coefficient	7.43
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility

Media	Fish-Water Partition Coefficient
Absorption coefficient	1120
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	2750
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment-Water Partition Coefficient
Absorption coefficient	881
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Soil-Water Partition Coefficient
Absorption coefficient	441
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.

Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Water
Estimated Distribution and Media Concentration	0.03%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Camphene
CAS No.	79-92-5
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air
Estimated Distribution and Media Concentration	99.4%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane

CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Soil
Estimated Distribution and Media Concentration	0.49%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Fish
Estimated Distribution and Media Concentration	0.00003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment
Estimated Distribution and Media Concentration	0.01%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Water
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air
Estimated Distribution and Media Concentration	99.5%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Fish-Water Partition Coefficient
Absorption coefficient	1120
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment-Water Partition Coefficient

Absorption coefficient	2750
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment-Water Partition Coefficient
Absorption coefficient	881
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I

Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Soil-Water Partition Coefficient
Absorption coefficient	441
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air-Water Partition Coefficient
Absorption coefficient	8.11
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	8720
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2

Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment-Water Partition Coefficient
Absorption coefficient	881
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Fish
Estimated Distribution and Media Concentration	0.00003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Sediment
Estimated Distribution and Media Concentration	0.01%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental

	models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Soil
Estimated Distribution and Media Concentration	0.49%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Water
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air
Estimated Distribution and Media Concentration	99.5%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	8720

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	2750
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility

Media	Soil-Water Partition Coefficient
Absorption coefficient	441
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Air-Water Partition Coefficient
Absorption coefficient	8.11
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Dihydropinene
CAS No.	473-55-2
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, estimated VP, log Kow, MP, water solubility
Media	Fish-Water Partition Coefficient
Absorption coefficient	1120
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press. Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Sediment
Estimated Distribution and Media Concentration	.019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Air-Water Partition Coefficient
Absorption coefficient	13.97
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental

	models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Aerosol
Estimated Distribution and Media Concentration	.000019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Suspended Sediment
Estimated Distribution and Media Concentration	.00059%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Soil
Estimated Distribution and Media Concentration	0.85%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Water
Estimated Distribution and Media Concentration	.014%

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Air
Estimated Distribution and Media Concentration	99.12%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP

Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9479
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Fish-Water Partition Coefficient
Absorption coefficient	3380
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	8316
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Sediment-Water Partition Coefficient
Absorption coefficient	2661
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.

Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Soil-Water Partition Coefficient
Absorption coefficient	1330
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	MW, VP, log Kow, water solubility, estimated MP
Media	Fish
Estimated Distribution and Media Concentration	.000048%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene

CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Sediment
Absorption coefficient	2661
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Water
Estimated Distribution and Media Concentration	.014%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Aerosol
Estimated Distribution and Media Concentration	.000019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Fish

Estimated Distribution and Media Concentration	.000048%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Suspended Sediment
Estimated Distribution and Media Concentration	.00059%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Sediment
Estimated Distribution and Media Concentration	.019%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Soil
Estimated Distribution and Media Concentration	0.85%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene

CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Air
Estimated Distribution and Media Concentration	99.12%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9479
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	8316
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Soil-Water Partition Coefficient

Absorption coefficient	1330
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Air-Water Partition Coefficient
Absorption coefficient	13.97
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *alpha*-Pinene
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*-pinene.
Media	Fish-Water Partition Coefficient
Absorption coefficient	3380
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9080
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Fish
Estimated Distribution and Media Concentration	0.00003%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0004%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Sediment
Estimated Distribution and Media Concentration	0.01%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Soil
Estimated Distribution and Media Concentration	0.53%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene

CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Fish-Water Partition Coefficient
Absorption coefficient	1120
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	2750
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Sediment-Water Partition Coefficient
Absorption coefficient	881
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I

Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Soil-Water Partition Coefficient
Absorption coefficient	441
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Air-Water Partition Coefficient
Absorption coefficient	7.43
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6

Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Water
Estimated Distribution and Media Concentration	0.03%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Terpenes, Terpenoids, Turpentine oil, *beta*-Pinene
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *beta*-pinene.
Media	Air
Estimated Distribution and Media Concentration	99.4%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Sediment
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Soil-Water Partition Coefficient

Absorption coefficient	1060
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Sediment-Water Partition Coefficient
Absorption coefficient	2100
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	6600
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Fish-Water Partition Coefficient
Absorption coefficient	2700
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum

CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9400
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Air
Estimated Distribution and Media Concentration	99%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.

References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Air-Water Partition Coefficient
Absorption coefficient	12
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Soil

Estimated Distribution and Media Concentration	0.8%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0005%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model

Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Fish
Estimated Distribution and Media Concentration	0.00004%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine gum

CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.)
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Water
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Soil
Estimated Distribution and Media Concentration	0.8%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or

	metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Aerosol
Estimated Distribution and Media Concentration	0.00002%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay

Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Fish
Estimated Distribution and Media Concentration	0.00004%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Sediment
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Water
Estimated Distribution and Media Concentration	0.02%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Air
Estimated Distribution and Media Concentration	99%

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Aerosol-Air Partition Coefficient
Absorption coefficient	9400
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.

Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Fish-Water Partition Coefficient
Absorption coefficient	2700
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Suspended Sediment-Water Partition Coefficient
Absorption coefficient	6600
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Sediment-Water Partition Coefficient
Absorption coefficient	2100
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Soil-Water Partition Coefficient

Absorption coefficient	1060
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Air-Water Partition Coefficient
Absorption coefficient	12
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole

Model Conditions	25 C, 100,000 lbs.
Test Type	Environmental Equilibrium Partitioning Model
Method	Mackay
Model Used	EQC V 2.11 Level I
Input Parameters	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Media	Suspended Sediment
Estimated Distribution and Media Concentration	0.0005%
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized fugacity calculation method. Data are considered reliable with restriction because this method does not allow for biodegradation or metabolism.
References	Trent University (1999) Level 1 Fugacity-based Environmental Equilibrium Partitioning Model Version 2.11. Based on Mackay, Donald (1991) Multimedia environmental models: The fugacity approach. Lewis Publishing, CRC Press, Boca Raton, FL.

3 Ecotoxicity

3.1 Acute Toxicity to Fish

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Sample consisted mainly of *alpha*-pinene with remainder being camphene, *beta*-pinene and *delta*-3-carene. It was a 50/50 mixture from each of 2 suppliers.
Method/guideline	OECD Guideline 203
Test Type	Fish acute - semistatic
GLP	Yes
Year	1993
Species/Strain/Supplier	*Brachydanio rerio* from "local supplier"
Analytical monitoring	None
Exposure Period	0, 24, 48, 72, 96 hours
Remarks for Test Conditions	Semistatic - water changed every 24 hours. Stock solution prepared by ultrasonication of 5000 mg/L mixture.
Observations on precipitation	Behavioral & lethality
Nominal concentrations as mg/L	10, 20, 50, 100, 200, 500
Reference substances	K2Cr2O7
Remarks fields for results	No effects at 20 mg/L until 100% mortality at 96 hours.
Conclusion Remarks	LC50 = 200-500 mg/L (48 hr); 100-200 mg/L (72 hr); 10-20 mg/L (96 hr)
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	The abrupt lethality at low doses with no clinical signs is suspect. All test levels reported are above water solubility. No analyses for concentrations or for composition.
Reference	Bjornestad E. (1993a) Fish acute toxicity test of *alpha*-pinene with zebrafish. Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	98% pure 1R(+)-isomer. Measured purity 91%.

Method/guideline	US EPA
Test Type	Fish acute - semistatic
GLP	No
Year	1990
Species/Strain/Supplier	Fathead minnows (Pimephales promelas)
Analytical monitoring	0, 24, 48, 72, 96 hrs
Exposure Period	96 hr
Remarks for Test Conditions	Sterilized, filtered water from Lake Superior. Changed every 24 hrs. Observations were loss of equilibrium and mortality.
Observations on precipitation	Behavioral & lethality
Nominal concentrations as mg/L	0.13,0.26,0.39,0.52,0.65
Measured concentrations as mg/L	0.058, 0.14, 0.23, 0.30, 0.42
Reference substances	Behavioral & lethality effects first seen at 24 hours.
Conclusion Remarks	EC50 = 0.18 mg/L (96hr); LC50 = 0.28 mg/L (96hr)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained by a recognized method and are consistent with chemical structure. Data are considered reliable.
Reference	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	99% pure 1S(-)-isomer. Measured purity 97%
Method/guideline	US EPA
Test Type	Fish acute - semistatic
GLP	No
Year	1990
Species/Strain/Supplier	Fathead minnows (Pimephales promelas)
Analytical monitoring	0, 24, 48, 72, 96 hrs.
Exposure Period	96 hr

Remarks for Test Conditions	Sterilized, filtered water from Lake Superior. Changed every 24 hours. Observations were loss of equilibrium and mortality.
Observations on precipitation	Behavioral & lethality
Nominal concentrations as mg/L	0.42,0.84,1.3,1.7, 2.1
Measured concentrations as mg/L	0.24, 0.58, 1.0, 1.2, 1.8
Remarks fields for results	Behavioral & lethality effects first seen at 24 hour.
Conclusion Remarks	EC50 = 0.50 mg/L (96 hr); LC50 = 0.50 mg/L (96 hrs)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained by a recognized method and are consistent with chemical structure and are considered reliable.
Reference	Broderius S., Hammermeister, D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Camphene minimum 80 %
Method/guideline	OECD Guideline 203
Test Type	Static
Species/Strain/Supplier	*Cyprinodon variegatus* (Fish, estuary, marine)
Exposure Period	96 hr
Remarks for Test Conditions	Because of limited solubility, camphene was dissolved in acetone and triethylene glycol for use in the static test.
Measured concentrations as mg/L	LC50 <1.8 mg/L at 24 hours, <2 mg/L at 48 hours, <2 hr mg/L at 72 hours, and <0.19 mg/L at 96 hours
Remarks fields for results	The static test was performed with natural seawater according to the test protocol, "Methods for acute toxicity tests with fish, macroinvertebrates and amphibians", US EPA, 1975.
Conclusion Remarks	LC50 = 1.9 mg/L
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	The results of the test are not reliable for extrapolation to fish acute toxicity under environmental conditions.
Reference	McGowan and Mellors (1986) Bull. Environ. Contam. Toxicol., 36(6), 881-887 and Heitmueller, Hollister, and Parrish (1981) Bull. Environ. Contam. Toxicol., 27(5), 596-604.

Substance Name	Camphene
CAS No.	79-92-5

Remarks for Substance	Substance is 86.7 % camphene
Method/guideline	OECD Guideline 203
Test Type	Flow-through
GLP	Yes
Year	1993
Species/Strain/Supplier	*Brachydanio rerio* (Fish, fresh water)
Exposure Period	96 hr
Remarks for Test Conditions	Due to the high vapor pressure and limited solubility of the test substance, experiments were performed in a closed flow through system.
Measured concentrations as mg/L	LC50 =1.40 mg/L at 24 hours, 1.21 mg/L at 48 hours, 0.94 mg/L at 72 hours, and 0.72 mg/L at 96 hours
Conclusion Remarks	LC50 = 0.72 mg/L.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Reference	Hoechst AG (1993) Dr. Noack (92.1127). Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	OECD Guideline 203
Test Type	Static
GLP	Yes
Year	1988
Species/Strain/Supplier	*Brachydanio rerio* (Fish, fresh water)
Exposure Period	96 hr
Remarks for Test Conditions	Because of limited solubility, camphene was dissolved in ethanol for use in the static test.
Measured concentrations as mg/L	LC50 = 125 mg/L, LC50 = 150 mg/L, LC100 = 180 mg/L
Conclusion Remarks	LC50 = 150 mg/L
Data Qualities Reliabilities	Reliability code 3. Not reliable
Remarks for Data Reliability	The results of the test are not reliable for extrapolation to fish acute toxicity under environmental conditions.
Reference	Hoechst AG (1988b) Unveroeffentlichte Untersuchung (88.0254). Unpublished report.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Turpentine gum a mixture of 50.8% alpha-pinene and 36.9% beta-pinene
Method/guideline	Static fish acute toxicity/OECD guideline 203
Test Type	96-hr acute fish toxicity test
GLP	Yes
Year	2000
Species/Strain/Supplier	Rainbow Trout (Oncorhynchus mykiss)/West Country Trout/Trafalgar Farm
Exposure Period	96 hrs
Remarks for Test Conditions	Groups of ten fish acclimatized for 7days at 15 C were exposed to nominal concentrations of 0, 1.0, 10.0 and 100 mg/L of gum turpentine for 96 hours at 15 C. Solutions of gum turpentine were water accommodated fractions prepared by stirring appropriate weight of test substance for 23 hours followed by 1 hour settling time prior to fish being introduced. Dilution water was dechlorinated tap water that was filtered, sterilized and refiltered (10 um). pH, conductivity dissolved oxygen, and free and residual chlorine were monitored daily and alkalinity and total ammonia were measured at the beginning of the study. Fish were exposed to 16 hours fluorescent light and 8 hours darkness. Fish were monitored for mortality and toxicity at 2, 24, 48, 72, and 96 hours.At end of exposure fish were weighed and measured.
Nominal concentrations as mg/L	1.0 10. And 100 mg/L
Remarks for Results	There were no symptoms of toxicity and no mortalities at concentrations up to and including 100 mg/L. During test, pH values were in the range from 7.67 to 7.90 and dissolved oxygen was 9.02 to 9.74 mg/L at 15+/-1 C.
Conclusion Remarks	The 96-hour no observable effect concentration (NOEC)=100 mg/L
Remarks for Data Reliability	The data are obtained by an OECD guideline method and are consistent with chemical structure. Data are considered reliable.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Reference	Swarbrick R.H. (2001) Gum turpentine: Acute toxicity to rainbow trout (Oncorhynchus mykiss). BL7033/B. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8

Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.22 mg/l
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.62 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure. Data are considered reliable.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.62 mg/l
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.

Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure. Data are considered reliable.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.63 mg/l
Remarks for Data Reliability	Reliability code 2. Reliable with restrictions.
Data Reliability Remarks	The data are obtained by a recognized SAR method and are consistent with chemical structure. Data are considered reliable.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.63 mg/l
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure. Data are considered reliable.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4

Remarks for Substance	Data considered the same as for the isomer *alpha*-pinene
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.28 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure. Data are considered reliable.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Remarks for Test Conditions	The input data are considered to be essentially the same as for *alpha*-pinene.
Conclusion Remarks	LC50 = 0.28 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Data Reliability Remarks	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta* phellandrene, 0-2% terpinolene.
Method/guideline	ECOSAR
Test Type	Calculated

Species/Strain/Supplier	Fish
Exposure Period	96 hr
Remarks for Test Conditions	The input data are considered to be essentially the same as for *beta*-pinene.
Conclusion Remarks	LC50 = 0.62 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.).
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr
Remarks for Test Conditions	The input data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Conclusion Remarks	LC50 = 0.35 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Data Reliability Remarks	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, cis-anethole, *trans*-anethole
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Fish
Exposure Period	96 hr

Remarks for Test Conditions	The input data are considered to be essentially the same as for *alpha* and *beta*-pinene.
Conclusion Remarks	LC50 = 0.35 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

3.2 Acute Toxicity to Aquatic Invertebrates

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	98% pure 1R(+)-isomer. Measured purity 91%
Method/guideline	US EPA
Species/Strain/Supplier	*Daphnia magna*
Test Type	Static 48 hr
GLP	No
Year	1990
Analytical procedures	0, 24, 48 hrs
Remarks for Test Conditions	Sterilized, filtered water from Lake Superior. Changed every 24 hrs. Observations were loss of equilibrium and mortality.
Control response satisfactory?	Yes
Conclusion Remarks	LC50 = 1.44 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Data Reliability Remarks	The data are obtained by a recognized method and are consistent with chemical structure.
Reference	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report..

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Sample consisted mainly of *alpha*-pinene with some camphene, *beta*-pinene and *delta*-3-carene. It was a 50/50 mixture from each of 2 suppliers.

Method/guideline	OECD Guideline 202
Test Type	Semistatic acute toxicity
Species/Strain/Supplier	*Daphnia magna*
GLP	Yes
Year	1993
Test details	Lake water used - renewed at 24 hrs
Remarks for Test Conditions	Stock solution prepared by ultrasonication of 2000 mg/L mixture
Nominal concentrations as mg/L	2,5, 10, 20, 50, 100, 200
EC50, EL50, LC0, at 24,48 hours	EC50 6.74 (48 hr), EC10 4.29 mg/L (48 hr)
Biological observations	Mobility
Control response satisfactory?	Yes
Appropriate statistical evaluations?	Yes
Conclusion Remarks	EC50 = 6.74 (48 hr)
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Data Reliability Remarks	All test levels reported are above water solubility. No analyses for concentrations or for composition.
Reference	Bjornestad E. (1993b) Immobilization test of *alpha*-pinene with the crustacean Daphnia magna, Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	99% pure 1S(-)-isomer. Measured purity 97%
Method/guideline	US EPA
Test Type	Static 48 hr
Species/Strain/Supplier	*Daphnia magna*
GLP	No
Year	1990
Analytical procedures	0, 24, 48 hrs
Remarks for Test Conditions	Sterilized, filtered water from Lake Superior. Changed every 24 hrs. Observations were loss of equilibrium and mortality.
Nominal concentrations as mg/L	0.39,0.78,1.17,1.56, 1.95

Measured concentrations as mg/L	0.30, 0.70, 0.85, 1.18, 1.66
Control response satisfactory?	Yes
Conclusion Remarks	LC50 = 1.25 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Data Reliability Remarks	The data are obtained by a recognized method and are consistent with chemical structure.
Reference	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Camphene 80 % minimum
Method/guideline	Static laboratory method "Methods for acute toxicity tests with fish, macroinvertebrates and amphibians", US EPA, 1975.
Species/Strain/Supplier	*Daphnia magna (Crustacea)*
GLP	Yes
Year	1980
Remarks for Test Conditions	The estimate of concentration of the test substance was made for a mechanically mixed solution.
Control response satisfactory?	Yes
Appropriate statistical evaluations?	Yes
Conclusion Remarks	EC50 = 22 mg/L (48hr): EC0 =<13 mg/L (48hr); EC50 = 46 mg/L (24hr)
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Data Reliability Remarks	The limits of water solubility were exceeded at the temperature tested. Solution was heterogeneous.
Reference	Hoechst AG (1980) Bull. Environ. Contam. Toxicol. 24, 684-691.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Turpentine gum a mixture of 50.8% *alpha*-pinene and 36.9% beta-pinene
Method/guideline	Acute Immobilization Test/OECD Guideline 202
Test Type	Static 48 hour
Species/Strain/Supplier	*Daphnia magna*

GLP	Yes
Year	2001
Remarks for Test Conditions	Daphnia (20), 24 hours old, were exposed to 0,1.0, 10.0 or 100 mg/L of turpentine gum for 48 hours at 20 C. Solutions of gum turpentine were water accommodated fractions prepared by stirring appropriate weight of test substance for 23 hours followed by 1 hour settling time prior to test. Reconstituted water medium used for testing was Elendt's M4 Daphnia medium. Test solutions were monitored for pH, conductivity, alkalinity, and total organic carbon. Daphnia were exposed to 16 hours fluorescent light and 8 hours darkness and were not fed during the 48 hour test period. At 24 and 48 hours, Daphnia were monitored for body movement with a 15 second period.
Control response satisfactory?	Yes
EC50, EL50, LC0, at 24,48 hours	EC50 = 10 to 100 mg/L
Nominal concentrations as mg/L	1.0, 10.0, and 100 mg/L
Remarks for Results	During test, pH values were in the range from 7.75 to 8.01 and dissolved oxygen was 9.0 to 9.2 mg/L at 15+/-1 C.
Conclusion Remarks	The 48 hour NOEC =10 mg/L and the EC50= 10-100 mg/L
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Data Reliability Remarks	The data are obtained by a OECD guideline method and are consistent with chemical structure. Data are considered reliable.
Reference	Long K. W. (2001a) Gum turpentine: Acute toxicity to Daphnia magnat. BL7032/B. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.22 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*beta*-Pinene
CAS No.	127-91-3

Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.79 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Substance supported under SIDS.
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.79 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.8 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.8 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Remarks for Substance	Data considered the same as for the isomer *alpha*-pinene
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Conclusion Remarks	LC50 = 0.22 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Remarks for Substance	Substance is 92-97% *alpha*-pinene and 1-7% *beta*-pinene.
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*-pinene.
Conclusion Remarks	LC50 = 1.44 mg/L (48 hr)

Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Remarks for Substance	Substance is 78-81% *beta*-Pinene, 8-10% *alpha*-Pinene, 1-5% dipenetene, 1-2% camphene, 1-3% *beta*-phellandrene, 0-2% terpinolene.
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Remarks for Test Conditions	The data are considered to be essentially the same as for *beta*-pinene.
Conclusion Remarks	LC50 = 1.25 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Substance is 60-65% *alpha*-pinene, 25-35% *beta*-pinene, 5-8% monocyclic terpenes (limonene, etc.).
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Conclusion Remarks	LC50 = 1.4 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	*Daphnia magna*
Remarks for Test Conditions	The data are considered to be essentially the same as for *alpha*- and *beta*-pinene.
Conclusion Remarks	LC50 = 1.4 mg/L (48 hr)
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical composition of the mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

3.3 Acute Toxicity to Aquatic Plants

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	US EPA ASTM, 1988
Species/Strain/Supplier	Green algae
Exposure Period	48 hrs
Conclusion Remarks	LC50 above water solubility. No effects at saturation.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained by a recognized method and are consistent with chemical structure.
Reference	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	OECD Guideline 201

Species/Strain/Supplier	Green algae
Exposure Period	24, 48, 72 hrs
Biological observations	Growth inhibition at 200 mg/L, Biomass lower at 100 mg/L, EC50 biomass = 278 mg/, growth = 973 mg/L.
Conclusion Remarks	EC50 = 0.973 mg/L (72 hr)
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	No analyses for concentrations or for composition. All test levels reported are above water solubility.
Reference	Petersen G.I. (1993) Growth inhibition test of *alpha*-pinene with the micro algae Selenastrum capricornutum, Project 303068, Water Quality Institute, Horsholm, Denmark.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	US EPA ASTM, 1988
Species/Strain/Supplier	Green algae
Exposure Period	48 hr
Conclusion Remarks	LC50 = 1.44 mg/L
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained by a recognized method and are consistent with chemical structure.
Reference	Broderius S., Hammermeister D.and Russom, C. (1990) Toxicity of eight terpenes to Fathead minnows (Pimephales promelas), Daphnids (Daphnia magna), and Algae (Selanastrum capricornutum), Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	OECD Guideline 201
Species/Strain/Supplier	Algae/Scenedesmus subspicatus
Exposure Period	72 hr
Conclusion Remarks	EC50 > 1000 mg/l -LC50 above water solubility (3.5 mg/L).
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	No analyses for concentrations or for composition. All test levels reported are above water solubility.
Reference	Hoechst AG (1991d) Unveröffentl. Unters. im Auftrag der (Ber.-Nr. 91.1203).

Substance Name	Turpentine gum
CAS No.	9005-90-7
Remarks for Substance	Turpentine gum composed of 50.8% *alpha*-pinene and 36.9% beta-pinene
Method/guideline	OECD Guideline 201
GLP	Yes
Year	2001
Test Type	72-Hour algal growth inhibition test
Species/Strain/Supplier	Selenastrum capricornutum/ATCC22662
NOEC, LOEC or NOEL, LOEL	NOEC
Nominal concentrations as mg/L	1.0, 10.0, and 100 mg/L
Exposure Period	72 hr
Biological observations	The was no significant differences between control and test cultures in algal cell density
Appropriate Statistical Evaluation	Yes (Dunnett, 1964)
Remarks for Test Conditions	Test vessels were inoculated with cultures to yield a nominal cell density of 1x10e4 cells//ml. Test concentrations were prepared with water accommodated fractions of test substance in which mixtures were stirred for 23 hours and settled for 1 hour before use. Six replicate culture of medium control and triplicate cultures of each test concentration were incubated at 24 C under conditions of cool white illumination with shaking at 160 rpm. Samples were removed at 24, 48, and 72 hours and algal cell densities were measured. pH and temperature were monitored during testing.
Conclusion Remarks	EC50= >100 mg/L and NOEC=100 mg/L
Remarks for Results	There was no statistically significant differences in algal cell density between test and control cultures. pH ranged from 7.45 to 7.49 at t=0 to 8.86 to 9..62 at t=72 hours. Temperature remained at 24 C throughout the study.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The data are obtained by a recognized method and are consistent with chemical structure.
Reference	Long K W.J. (2000) Gum turpentine: Toxicity to the green alga Selenastrum capricornutum. Report No. BL/7031/B. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8

Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.22 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.79 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.56 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.

Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*cis*-Pinane
CAS No.	6876-13-7
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.57 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Dihydropinene
CAS No.	473-55-2
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.57 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	*l-alpha*-Pinene
CAS No.	7785-26-4
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae

Exposure Period	96 hr
Conclusion Remarks	LC50 = 0.22 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical structure.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *alpha*-Pinene fraction
CAS No.	65996-96-5
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Conclusion Remarks	LC50 (above water solubility) = 0.65 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Terpenes & Terpenoids, Turpentine oil, *beta*-Pinene fraction
CAS No.	65996-97-6
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	48 hr
Conclusion Remarks	LC50 = 1.44 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine gum
CAS No.	9005-90-7

Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 1.44 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Method/guideline	ECOSAR
Test Type	Calculated
Species/Strain/Supplier	Green algae
Exposure Period	96 hr
Conclusion Remarks	LC50 = 1.44 mg/L
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The data are obtained by a recognized SAR method and are consistent with chemical mixture.
Reference	Nabholz V. and Cash, G. (1998) ECOSAR, U.S. Environmental Protection Agency, OPPT Risk Assessment Division.

4 Human Health Toxicity

4.1 Acute Toxicity

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Clear liquid
Method/guideline	Not given
Test Type	Acute oral LD50
Year	1972
Species/strain	Rat/Wistar
Sex	Male
# of animals per sex per dose	10
Vehicle	Oral
Remarks for Test Conditions	Ten rats per dose were administered 0, 2020, 3200, 5000, 7800 mg/kg bw *alpha*-pinene. Food and water was provided ad libitum. Animals were observed for toxic signs and death at 1 and 6 hours after dosing and daily thereafter. Gross necropsies were performed on all 10 rats per dose were administered 0, 2020, 3200, 5000, 7800 mg/kg bw *alpha*-pinene. Food and water was provided ad libitum. Animals were observed for toxic signs and death at 1 and 6 hours after dosing and daily thereafter. Gross necropsies were performed on all survivors.
Value LD50 or LC50 with confidence limits	3700 mg/kg bw (95% confidence limit 2300-5100 mg/kg bw)
Number of deaths at each dose level	2020 mg/kg bw, 2/10; 3200 mg/kg bw, 5/10; 5000 mg/kg bw, 6/10; 7800 mg/bw, 9/10
Remarks for Results	The animals experienced diarrhea and urinary incontinence. Deaths occurred from 2 hours after administration to 2 days following.
Conclusion Remarks	The LD50 calculated from the data was 3700 mg/kg bw (95% C.L. 2300-5100 mg/kg bw).
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1972a) Acute oral toxicity in rats. Unpublished report to RIFM.

Substance Name	*beta*-Pinene
CAS No.	127-91-3

Remarks for Substance	Not given
Method/guideline	Litchfield and Wilcoxon
Test Type	Acute oral LD50
Year	1984
Species/strain	Rat/Sprague-Dawley albino
Sex	Male and Female
# of animals per sex per dose	5
Vehicle	Distilled water
Route of Administration	Intraperitoneal injection
Remarks for Test Conditions	A preliminary dose range finding study was performed prior to the LD50 part of the experiment. Based on those results, five male and five female rats were administered 1590, 2150, 2930, 3980 and 5410 mg/kg bw *beta*-pinene. Water was provided ad libitum. Food was returned to the animals one hour after dosing. Animals were observed for signs of toxicity and mortality at 1, 3 and 6 hours after dosing and daily for the remainder of the 14 day observation period. Gross necropsies were performed on all survivors.
Value LD50 or LC50 with confidence limits	LD50: 3388 mg/kg bw for both sexes (95% confidence limit of 2728 to 4209 mg/kg bw); 3387 mg/kg bw for male rats (95% confidence limit of 2495 to 4599 mg/kg bw); 3415 mg/kg bw for female rats (95% confidence limit of 2472 to 4716 mg/kg bw).
Number of deaths at each dose level	1590 mg/kg bw-no deaths; 2150 mg/kg bw, 1M/1F; 2930 mg/kg bw-2M/1F; 3980 mg/kg bw-2M/3F; 5410 mg/kg bw-5M/4F
Conclusion Remarks	The LD50 was reported to be 3388 mg/kg bw for both sexes (95% confidence limit of 2728 to 4209 mg/kg bw); 3387 mg/kg bw for male rats (95% confidence limit of 2495 to 4599 mg/kg bw); 3415 mg/kg bw for female rats (95% confidence limit of 2472 to 4716 mg/kg bw).
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	The basic data given is comparable to guidelines/standards. Small number of animals used.
References	Piccirillo V.J. (1984) Fourteen Day Subacute Toxicity Study in the Rat. Private communication.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	Not given
Method/guideline	Limit test
Test Type	Acute oral LD50
Year	1975

Species/strain	Rat/Wistar
Sex	Not reported
# of animals per sex per dose	10
Route of Administration	Oral
Remarks for Test Conditions	Ten rats were administered 5000 mg/kg bw *beta*-pinene. Food and water was provided ad libitum. Gross necropsies were performed on all survivors.
Value LD50 or LC50 with confidence limits	> 5000 mg/kg bw
Number of deaths at each dose level	1 death on observation day 7
Conclusion Remarks	The oral LD50 was reported to be > 5000 mg/kg bw.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1975a) Acute oral toxicity in rats. Unpublished report to RIFM.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	Limit test
Test Type	Acute oral LD50
Year	1974
Species/strain	Rat/Wistar
Sex	Not reported
# of animals per sex per dose	10
Route of Administration	Oral
Remarks for Test Conditions	Ten rats were administered 5000 mg/kg bw camphene. Food and water was provided ad libitum. Gross necropsies were performed on all survivors.
Value LD50 or LC50 with confidence limits	> 5000 mg/kg bw
Number of deaths at each dose level	2/10 at 5000 mg/kg bw
Conclusion Remarks	The acute oral LD50 = > 5000 mg/kg
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1974a) Acute oral toxicity in rats. Unpublished report to RIFM.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Test Type	Acute oral LD50
Year	1959
Species/strain	Rat/White
Sex	Not reported
# of animals per sex per dose	5
Route of Administration	Oral
Remarks for Test Conditions	3 day observation
Value LD50 or LC50 with confidence limits	5.76 ml/kg (4953 mg/kg)
Number of deaths at each dose level	Not reported
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards. Small number of animals and short observation time.
References	von Skramlik E. (1959) On the toxicity and compatibility of essential oils. Die Pharmazie, 14, 435-445.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Test Type	Acute oral LD50
Year	1972
Species/strain	Rat/Wistar
Sex	Male
# of animals per sex per dose	10
Route of Administration	Oral
Remarks for Test Conditions	Ten rats were administered doses of turpentine oil. Food and water was provided ad libitum. Gross necropsies were performed on all survivors.

Value LD50 or LC50 with confidence limits	4.6 ml/kg (3956 mg/kg)
Number of deaths at each dose level	1/10 at 3.2 (2752 mg/kg), 4/10 at 4 (3440 mg/kg), 6/10 at 5 (4300 mg/kg) and 8/10 at 6.25 (5375 mg/kg) ml/kg bw
Conclusion Remarks	The oral acute LD50 = 4.6 ml/kg (3956 mg/kg)
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Data Reliabilities Remarks	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1972a) Acute oral toxicity in rats. Unpublished report to RIFM.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Method/guideline	Limit test
Test Type	Acute oral LD50
Year	1972
Species/strain	Rat/Wistar
Sex	Male
# of animals per sex per dose	10
Vehicle	Oral
Remarks for Test Conditions	Ten rats were administered 5000 mg/kg bw turpentine oil. Food and water was provided ad libitum. Gross necropsies were performed on all survivors.
Value LD50 or LC50 with confidence limits	< 5000 mg/kg bw
Number of deaths at each dose level	6/10 at 5000 mg/kg bw
Conclusion Remarks	The acute oral LD50 =<5000 mg/kg
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards. Greater than 50% mortality at limit dose.
References	Moreno O.M. (1972a) Acute oral toxicity in rats. Unpublished report to RIFM.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Clear liquid

Method/guideline	Limit test
Test Type	Acute dermal LD50
Year	1972
Species/strain	Rabbits/New Zealand White
Sex	Not reported
# of animals per sex per dose	10
Route of Administration	Dermal
Remarks for Test Conditions	A single 24 hour application was made to the clipped abraded abdominal skin of ten rabbits weighing 2.0 to 2.3 kg. Observations were made for mortality and toxic effects for a period of seven days. Gross necropsies were performed on all animals at the termination of the study.
Value LD50 or LC50 with confidence limits	> 5000 mg/kg bw
Number of deaths at each dose level	0 at 5000 mg/kg
Conclusion Remarks	The LD50 was reported to be > 5000 mg/kg bw.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1972b) Acute dermal toxicity of *alpha*-pinene in rabbits. Unpublished report to RIFM.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	Limit test
Test Type	Acute dermal LD50
Year	1975
Species/strain	Rabbits/New Zealand White
Sex	Not reported
# of animals per sex per dose	10
Route of Administration	Dermal
Remarks for Test Conditions	A single 24 hour application was made to the clipped abraded abdominal skin of ten rabbits. Observations were made for mortality and toxic effects for a period of seven days. Gross necropsies were performed on all animals at the termination of the study.
Value LD50 or LC50 with confidence limits	> 5000 mg/kg bw

Number of deaths at each dose level	0 at 5000 mg/kg bw
Conclusion Remarks	The LD50 was reported to be > 5000 mg/kg bw.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O.M. (1975b) Acute dermal toxicity of *beta*-pinene in rabbits. Unpublished report to RIFM.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	Limit test
Test Type	Acute dermal LD50
Year	1974
Species/strain	Rabbits/New Zealand White
Sex	Not reported
# of animals per sex per dose	3 at 2500 mg/kg and 2 at 5000 mg/kg
Route of Administration	Dermal
Remarks for Test Conditions	A single 24 hour application was made to the clipped abraded abdominal skin of ten rabbits. Observations were made for mortality and toxic effects for a period of seven days. Gross necropsies were performed on all animals at the termination of the study.
Value LD50 or LC50 with confidence limits	> 2500 mg/kg bw
Number of deaths at each dose level	1 at 5000 mg/kg bw
Conclusion Remarks	The dermal LD50 was reported to be > 2500 mg/kg bw.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Data Reliabilities Remarks	Data collected prior to GLP by method comparable to present guidelines/standards. Small number of animals used.
References	Moreno O.M. (1974b) Acute dermal toxicity of camphene in rabbits. Unpublished report to RIFM.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Substance is 59% *alpha*-pinene, 24% *beta*-pinene, 5% dipentene, 2% each *beta*-phellandrene, *alpha*-terpineol, & linalool, 1% each methyl chavicol, *cis*-anethole, *trans*-anethole
Test Type	Acute dermal LD50

Year	1972
Species/strain	Rabbits/New Zealand White
Sex	Not reported
# of animals per sex per dose	10
Route of Administration	Dermal
Remarks for Test Conditions	A single 24 hour application was made to the clipped abraded abdominal skin of ten rabbits. Observations were made for mortality and toxic effects for a period of seven days. Gross necropsies were performed on all animals at the termination of the study.
Value LD50 or LC50 with confidence limits	> 2000 mg/kg bw
Number of deaths at each dose level	0/10 at 2000 mg/kg bw
Conclusion Remarks	The dermal LD50 was reported to be > 2000 mg/kg bw.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Moreno O. M. (1972c) Acute dermal toxicity of turpentine oil in rabbits. Unpublished report to RIFM.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine
Method/guideline	Litchfield and Wilcoxon
Test Type	Inhalation LC50
Year	1967
Species/strain	Rat/Wistar, Mice/Swiss Webster white
Sex	Male
# of animals per sex per dose	10
Route of Administration	Inhalation
Remarks for Test Conditions	Groups of rats were exposed to 12,600-15,700, 15,800-19,800, 19,900-25,000, or 25,100-31,500 mg/m3 of the test substance via inhalation for 1,2, 4, or 6 hours (mice were exposed to the same concentrations for 2 hours only). Turpentine concentrations in six different rat tissues (brain, spleen, kidney, liver, lung, blood) were determined by gas layer chromatography for groups of 3 rats after 1 and 2 hours of exposure or at 15,30, and 60 minutes post-exposure. Lungs of animals were examined histologically.

Value LD50 or LC50 with confidence limits	Rats: 1 hr LC50=19,900 mg/m3 95% C.L. (17,500-22,700 mg/m3); 2 hr: LC50=16,600 mg/m3 95% C.L. (15,900-17,900 mg/m3); 4 hr: LC50=13,700 mg/m3 95% C.L. (11,100-14,800 mg/m3); 6 hr LC50=11,700 mg/m3 95% C.L. (10,600-12,700 mg/m3)
Remarks for Results	There was a dose related increase in respiratory rate and a decrease in tidal volume. Tissue distribution of turpentine following exposure and at 60 minutes post-exposure showed highest concentration in the brain and spleen. There was no evidence of pulmonary lesions induced by turpentine.
Conclusion Remarks	The LC50's for 1-6 hours exposure in rats was in the range from 12,000 -20,000 mg/3); The LC50 for 2 hour exposure in mice was 29,000 mg/m3.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards. Study included well-documented analytical methods and comprehensive tissue analysis.
References	Sperling F., Marcus, W., and Collins, C. (1967) Acute effects of turpentine vapor on rats and mice. Toxicology and Applied Pharmacology 10, 8-20.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Not given
Test Type	Inhalation ED25
Year	1977
Species/strain	Mouse/CF1
Sex	Female
# of animals per sex per dose	5
Route of Administration	Inhalation
Remarks for Test Conditions	The respiratory irritation potential of fragrance raw materials was assessed in CF-1 females by recording respiration rate using a whole body plethysmograph. Mice were exposed to test materials for 1 minute using a nebulizer for aerosolization in a 2600 ml chamber. Materials shown to be sensory irritants were further tested in mice cannulated via the trachea and compared to an intact mouse breathing through its nose. Comparisons made were between the pre-exposure & exposure rate values for each material at each dose level. Materials were of undetermined purity.
Value LD50 or LC50 with confidence limits	No ED25 was determined. No dose response relationship.
Remarks for Results	Lower tract exposures not performed.
Conclusion Remarks	The ED25 was not reported. No respiratory irritation effects were reported.

Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards.
References	Troy W.R. (1977) Doctoral Dissertation: The comparative respiratory irritation potential of fourteen fragrance raw materials. Unpublished report to RIFM.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine
Method/guideline	Litchfield and Wilcoxon
Test Type	Inhalation LC50
Year	1962
Species/strain	Rat/Sprague-Dawley, Guinea pigs/albino, Mice/Swiss white
Sex	Not reported
# of animals per sex per dose	4
Route of Administration	Inhalation
Remarks for Test Conditions	Five groups of four animals each (with the exception of the guinea pigs which had only 2 per group) were exposed to 2400, 4800, 9500, 19000, and 38000 mg/m3 of the test substance via inhalation for six hours (mice were exposed to 2200, 4500, 9000, 18000 and 36000 mg/m3). The animals were observed for fourteen days following the exposure period.
Value LD50 or LC50 with confidence limits	Rats: LC50 = 13500 mg/m3 95% C.L. (6170-29500 mg/m3); Guinea Pigs: LC50 =13500 mg/m3 95% C.L. (6170-29500 mg/m3); Mice: LC50 = 9000 mg/m3 95% C.L. (7000-11600 mg/m3)
Number of deaths at each dose level	Rats: 0 at 2400 mg/m3, 0 at 4800 mg/m3, 0 at 9500 mg/m3, 4 at 19500 mg/m3, 4 at 38000 mg/m3; Guinea Pigs: 0 at 2400 mg/m3, 0 at 4800 mg/m3, 0 at 9500 mg/m3, 2 at 19500 mg/m3, 2 at 38000 mg/m3; Mice: 0 at 2200 mg/m3, 0 at 4500 mg/m3, 2 at 9000 mg/m3, 4 at 18000 mg/m3, 4 at 36000 mg/m3
Conclusion Remarks	The LC50's were calculated as follows: Rats: LC50=13500 mg/3, 95% C.L. (6170-29500 mg/m3); Guinea Pigs: LC50=13500 mg/m3, 95% C.L. (6170-29500 mg/m3); Mice: LC50=9000 mg/m3, 95% C.L. (7000-11600 mg/m3)
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Data collected prior to GLP by method comparable to present guidelines/standards. Small number of animals used.
References	Kohn F. (1962) Acute inhalation toxicity study on turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

4.2 Genetic Toxicity

4.2.1 In vitro Genotoxicity

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No
Year	1979
Species/Strain	*Salmonella typhimurium* TA 100 and TA98
Metabolic Activation	Rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	0.5-300 ul/plate
Remarks for Test Conditions	The test material (0.5 ml) was administered directly through a gastric tube to 2 Sprague-Dawley rats with an average weight of 250 grams. The rats were maintained in polyethylene metabolism cages, which are constructed to separate feces from urine. Urine was collected on ice for a 24-hour period, removed and sterilized by filtration. Control urines from rats, which received only water, were collected. Ames tests were conducted in strains TA100 and TA98 with and without *beta*-glucuronidase. 50-300 ul of 24-hour direct urine samples were assayed. After a 48-hour incubation at 37 °C, each assay plate was counted and the number of spontaneous mutants for either TA98 (40) or TA100 (180) were subtracted from the total number of revertants. Routine positive control plates were prepared to verify the reversion properties of each strain: sodium azide and picrolonic acid were used to check TA100 and TA98 respectively. The positive response to mutagenicity with TA100 is defined as any deviation above the upper 99.9% confidence limits of the mean control value. This value (180) is the average number of spontaneous TA100 revertants observed on the control plates. Testing of *alpha*-pinene directly using the AMES assay, as described above, was also performed with metabolic activation.
Results	No mutagenic effects for either the urinary metabolite assay or the assay using *alpha*-pinene directly.
Conclusion Remarks	No evidence of mutagenicity.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Does not meet criteria of today's standard methods but data were obtained by similar methodology and published in a peer reviewed journal.

References	Rockwell P. and Raw I. (1979) A mutagenic screening of various herbs, spices, and food additives. Nutrition and Cancer, Vol. 1. No. 4, 10-15.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No
Year	1980
Species/Strain	*Salmonella typhimurium* TA 98, TA 100
Metabolic Activation	With and without rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	0.03, 0.3, 3, 30 umoles/plate (4.08, 40.8, 408, and 4080 ug/plate)
Remarks for Test Conditions	The solvent used was ethanol. Only one replicate was performed for the substances, which tested negative.
Results	No mutagenic effects.
Cytotoxic concentration	>3 umoles/plate
Remarks for Results	Precipitates at 30 umoles/plate (4080 ug/plate); toxic at doses greater than 3 umoles/plate (408 ug/plate).
Conclusion Remarks	No evidence of mutagenicity
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Does not meet criteria of today's standard methods but data were obtained by similar methodology and published in a peer reviewed journal.
References	Florin I., Rutberg, L., Curvall, M., and Enzell, C.R. (1980) Screening of tobacco smoke constituents for mutagenicity using the Ames test. Toxicology, 18, 219-232.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No

Year	1989
Species/Strain	*Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100
Metabolic Activation	Rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	25000 ug/plate
Remarks for Test Conditions	After two days incubation at 37 °C, revertant colonies were counted.
Results	No mutagenic effects.
Conclusion Remarks	No evidence of mutagenicity.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study and data published in a peer reviewed journal.
References	Heck J. D., Vollmuth, T. A., Cifone, M. A., Jagannath, D. R., Myhr B., and R.D. Curren (1989) An evaluation of food flavoring ingredients in a genetic toxicity screening battery The Toxicologist, 9(1), 257.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Clear colorless liquid
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	Yes
Year	1984
Species/Strain	*Salmonella typhimurium* TA100, TA98, TA1538, TA1537, TA1535
Metabolic Activation	Aroclor induced rat liver microsomal enzyme preparations
Doses/Concentration	0, 0.1, 0.25, 0.5, 1.0, 2.5, 5.0, 10.0, 25 microliters/plate
Remarks for Test Conditions	Doses were selected based on a preliminary toxicity study of 14 doses in the range from 0.02 ul to 150.0 ul/plate using strain TA100. The test substance was toxic at doses at and above 4.69 ul/plate. The mutagenicity assays were conducted using three plates per dose level. Ethanol was used as the solvent and the negative control. For non-activated assays the positive controls included sodium azide (TA-1535 and TA-100), 2-nitrofluorene (TA-1538 and TA-98), 9-aminoacridine (TA-1537); and for the activated assays, 2-aminoanthracene was used for all strains.
Results	Negative in the absence and presence of metabolic activation. Tests with TA98 were repeated at all doses because of the

	increased number of revertants observed at the 10 microliter dose level in the initial assay. The repeat test was negative.
Cytotoxic concentration	4.69 ul/plate
Conclusion Remarks	*alpha*-Pinene did not exhibit mutagenic activity at any dose level tested.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study.
References	Jagannath D.R. (1984) Mutagenicity evaluation of *alpha*-pinene. Private communication. Unpublished report.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	Clear colorless liquid
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	Yes
Year	1983
Species/Strain	*Salmonella typhimurium* TA100, TA98, TA1538, TA1537, TA1535
Metabolic Activation	Aroclor induced rat liver microsomal enzyme preparations
Doses/Concentration	0, 0.01, 0.05, 0.1, 0.5, 1.0, 2.5, 5.0 ul/plate
Remarks for Test Conditions	Doses were selected based on a preliminary toxicity study of 14 doses ranging from 0.02 microliters to 150.0 ul/plate using strain TA100. The test substance completely toxic at doses at and above 4.69 ul/plate. DMSO was used as the solvent and the negative control. Positive controls were used and for non-activated assays included sodium azide (TA-1535 and TA-100), 2-nitrofluorene (TA-1538 and TA-98), 9-aminocridine (TA-1537); for the activated assays, 2-aminoanthracene was used for all strains.
Results	Negative in the absence and presence of metabolic activation.
Cytotoxic concentration	4.69 ul/plate
Conclusion Remarks	*beta*-Pinene did not exhibit mutagenic activity at any dose level tested.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study.
References	DeGraff W.G. (1983) Mutagenicity evaluation of beta-pinene. Private communication. Unpublished report.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No
Year	1989
Species/Strain	*Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100
Metabolic Activation	Rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	Up to 5000 ug/plate
Remarks for Test Conditions	After two days incubation at 37°C, revertant colonies were counted.
Results	No mutagenic effects.
Conclusion Remarks	No evidence of mutagenicity.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study and data published in a peer reviewed journal.
References	Heck J. D., Vollmuth, T. A., Cifone, M. A., Jagannath, D. R., Myhr B., and R.D. Curren (1989) An evaluation of food flavoring ingredients in a genetic toxicity screening battery. The Toxicologist, 9(1), 257.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No
Year	1980
Species/Strain	*Salmonella typhimurium* TA 98, TA 100
Metabolic Activation	With and without rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	0.03, 0.3, 3, 30 umoles/plate (4.08, 40.8, 408, and 4080 ug/plate)

Remarks for Test Conditions	The solvent used was ethanol. Only one replicate was performed for the substances, which tested negative.
Results	No mutagenic effects.
Cytotoxic concentration	> 3 umoles/plate
Remarks for Results	Toxic at doses greater than 3 umole/plate.
Conclusion Remarks	No mutagenic activity.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Does not meet criteria of today's standard methods but data were obtained by similar methodology and published in a peer reviewed journal.
References	Florin I., Rutberg L., Curvall M., and Enzell C.R. (1980) Screening of tobacco smoke constituents for mutagenicity using the Ames test. Toxicology, 18, 219-232.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
GLP	No
Year	1979
Species/Strain	*Salmonella typhimurium* TA 100 and TA98
Metabolic Activation	Rat liver microsome fraction S9 from Aroclor induced rats
Doses/Concentration	0.5-300 ul/plate
Remarks for Test Conditions	The test material (0.5 ml) was administered directly through a gastric tube to 2 Sprague-Dawley rats with an average weight of 250 gm. The rats were maintained in polyethylene metabolism cages, which are constructed to separate feces from urine. Urine was collected on ice for a 24 hour period, removed and sterilized by filtration. Control urines from rats, which received only water, were collected. Ames tests were conducted in strains TA100 and TA98 with and without *beta*-glucuronidase and with metabolic activation. 50-300 ul of 24 hour direct urine samples were assayed. After a 48 hour incubation at 37 °C, each assay plate was counted and the number of spontaneous mutants for either TA98 (40) or TA100 (180) were subtracted from the total number of revertants. Routine positive control plates were prepared to verify the reversion properties of each strain: sodium azide and picrolonic acid were used to check TA100 and TA98, respectively. The positive response to mutagenicity with TA100 is defined as any deviation above the upper 99.9% confidence limits of the mean

	control value. This value (180) is the average number of spontaneous TA100 revertants observed on the control plates. Testing of camphene directly using the AMES assay as described above was also performed with metabolic activation.
Results	The ether extracts of the 2 hour urine samples of rats fed 0.5 ml of camphene were weakly mutagenic with activation toward TA100 but not TA98. The AMES assay using camphene (not the urinary metabolite) with metabolic activation was negative.
Remarks for results	A weak response was seen in TA100 only with the ether extract of the urinary metabolite and only with metabolic activation. A negative response was reported for camphene in all other extracts tested directly with or without metabolic activation.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Does not meet criteria of today's standard methods but data were obtained by similar methodology and published in a peer reviewed journal.
References	Rockwell P. and Raw, I. (1979) A mutagenic screening of various herbs, spices, and food additives. Nutrition and Cancer, 1(4), 10-15.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	AMES salmonella/microsome mutagenesis assay
Test Type	Reverse mutation
System of Testing	Bacterial
Year	1985
Species/Strain	*Salmonella typhimurium* TA 100, TA98, UTH8414, UTH8413
Metabolic Activation	Rat liver microsome fraction S9 from Aroclor induced male Sprague-Dawley rats
Doses/Concentration	10-1000 ug/plate
Remarks for Test Conditions	The assays were carried out with and without metabolic activation. The test substance was diluted in DMSO and tested at five concentrations in duplicate. Plates were incubated at 37 °C for 48 hours, at which the number of colonies per plate were counted. Sodium azide (10 ug/plate) was the positive control for TA100 without S9; cisplatin (10 ug/plate) was the positive control for UTH8414 and UTH 8413 without S9. 2-Aminoanthracene (10 ug/plate) was the positive control for TA98 with S9.
Results	Negative in the absence and presence of metabolic activation.
Conclusion Remarks	Camphene was not mutagenic in *Salmonella typhimurium* strains TA98, TA100, UTH8413 or UTH8414 with or without metabolic activation.
Data Qualities Reliabilities	Reliability code 2. Reliable with restriction.

Remarks for Data Reliability	Does not meet criteria of today's standard methods but data were obtained by similar methodology and published in a peer reviewed journal.
References	Connor T.H., Theiss J., Hanna H., Monteith D. and Matney T. (1985) Genotoxicity of organic chemicals frequently found in the air of mobile homes. Toxicology Letters, 23, 33-40.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Method/guideline	Unscheduled DNA Synthesis Assay (UDS)
Remarks for Substance	Clear colorless liquid
System of Testing	Rat hepatocytes
Year	1989
Species/Strain	Rat/Fischer and Sprague Dawley adult male
Metabolic Activation	No
Doses/Concentration	0.001, 0.003, 0.01, 0.03, 0.1, 10 ul/ml
Remarks for Test Conditions	Livers were perfused in situ with 0.5 mM EDTA in HEPES buffer (pH 7.2) for four minutes. Cultures of rat liver hepatocytes were incubated with the test material for 18-20 hours. UDS was measures by electronically counting nuclear grains and subtracting the average number of grains in 3 adjacent nuclear sized cytoplasmic areas. 75-150 cells were analyzed for each dose level. The test was considered positive if an increase in net nuclear grain count of at least six grains per nucleus above the solvent control and/or an increase in the percent of nuclei with at least 6 net grains to more than 10% above the negative control value.
Results	Negative at all dose levels
Remarks for Results	The test article did not cause a significant increase in UDS as measured by the mean number of net nuclear grain counts ay any dose level. The positive control, 7,12-dimethylbenz(a)-anthracene (DMBA), induced significant increases in the mean number of net nuclear grain counts compared to the solvent control.
Cytotoxic concentration	Non-toxic at all dose levels
Conclusion Remarks	There was no evidence of genotoxicity based on the results of the rat unscheduled DNA synthesis assay.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study and data published in a peer reviewed journal.
References	Heck J. D., Vollmuth, T. A., Cifone, M. A., Jagannath, D. R., Myhr B., and R.D. Curren (1989) An evaluation of food flavoring ingredients in a genetic toxicity screening battery. The Toxicologist, 9(1), 257.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Method/guideline	Sister Chromatid Exchange in cultured Chinese hamster ovary cells
Test Type	SCE
System of Testing	Chinese hamster ovary cells
Year	1989
Species/Strain	Chinese hamster ovary cells
Metabolic Activation	No
Doses/Concentration	0, 3.3, 10, 33.3, 100, 333, 1000 uM
Statistical Methods	Student's T test (*alpha*=0.05 - 0.001)
Remarks for Test Conditions	The solvent was DMSO. The Chinese hamster K-1 (CHO K-1) cells were exposed to 0.15 micromolar mitomycin C (MMC) for 21 hours and cultured with the test substance for 1 cell cycle. The mean frequency of SCE's was calculated from 3 independent experiments.
Results	No effect
Remarks for Results	*beta*-Pinene did not induce sister chromatid exchanges in CHO cells.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study with acceptable restrictions and data published in a peer reviewed journal.
References	Sasaki Y.F., Imanishi H., Ohta T. and Shirasu Y. (1989) Modifying effects of components of plant essence on the induction of sister-chromatid exchanges in cultured Chinese hamster ovary cells. Mutation Research, 226, 103-110.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	Sister Chromatid Exchange (SCE) in cultured Chinese hamster ovary cells
Test Type	SCE
System of Testing	Chinese hamster ovary cells
Year	1989
Species/Strain	Chinese hamster ovary cells
Metabolic Activation	No

Doses/Concentration	0, 3.3, 10, 33.3, 100, 333, 1000 uM
Statistical Methods	Student's T test (*alpha*=0.05 - 0.001)
Remarks for Test Conditions	The solvent was DMSO. The Chinese hamster K-1 (CHO K-1) cells were exposed to 0.15 micromolar mitomycin C (MMC) for 21 hours and cultured with the test substance for 1 cell cycle. The mean frequency of SCE's was calculated from 3 independent experiments.
Results	No evidence of clastogenicity.
Appropriate statistical evaluations?	No significant increase
Remarks for Remarks	Camphene did not induce sister chromatid exchanges in CHO cells.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Comparable to guideline study with acceptable restrictions and data published in a peer reviewed journal.
References	Sasaki Y.F., Imanishi H., Ohta T. and Shirasu Y. (1989) Modifying effects of components of plant essence on the induction of sister-chromatid exchanges in cultured Chinese hamster ovary cells. Mutation Research, 226, 103-110.

4.2.2 In vivo Genotoxicity

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Technical grade
Method/guideline	OECD Guideline 474
Test Type	Micronucleus assay
GLP	Yes
Year	1991
Species/Strain	NMRI mouse
Sex	Male and Female
Route of Administration	Gavage
Doses/Concentration	0, 4000 mg/kg bw
Exposure Period	Single dose
Remarks for Test Conditions	5 animals/sex/group
NOEL (C)/ LOEL (C)	4000 mg/kg bw

Appropriate statistical evaluations?	Yes
Remarks for Results	The number of micronucleated erythrocytes was not significantly increased in test article treated groups, regardless of sex.
Conclusion Remarks	Under the conditions of the assay, camphene did not increase the incidence of bone marrow micronucleated polychromatic erythrocytes and was concluded to be negative in the micronucleus test using male and female NMRI mice.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	Study performed according to an OECD Guideline 474.
References	Hoechst AG (1991e) Unveröffentl. Unters. (Ber.-Nr. 91.0246).

4.3 Repeat dose Toxicity

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	Test substance was polyterpene, which is a resin of *beta*-pinene. Polyterpene prepared as 30 percent suspensions in corn oil.
Method/guideline	90-day sub-acute oral dietary
Species/strain	Rat/Sprague-Dawley
Sex	Male and Female
Route of Administration	Oral (diet)
Doses/concentration Levels	0, 0.01, 0.05, 0.2, 1.0, or 5.0% (100, 500, 2000,10,000, or 50,000 ppm in the diet)
Exposure Period	90 days
Frequency of Treatment	Daily ad libitum feeding
Control Group	2 control groups of 20 rats each (male and female)
Post Exposure Observation Period	None
Remarks for Test Conditions	Five groups of 20 Sprague-Dawley male and female albino rats each were administered in corn oil 0.01, 0.05, 0.2, 1.0 and 5.0% polyterpene in the diet for 90 days. Two groups of control animals, also made up of 20 animals each were administered the corn oil vehicle alone at the same percentage as the test animal. The animals were observed for toxicity including growth, food consumption, mortality, and status of hematopoietic and urinary systems. All animals were sacrificed at the conclusion of the study, and necropsies were performed on all animals. Selected animals from the control and test groups were examined histopathologically.

NOAEL (NOEL)	116.5 mg/kg bw/d
LOAEL (LOEL)	586.2 mg/kg bw/d
Actual Dose Received by Dose Level and Sex	5.82, 29.58, 116.5, 586.2 or 2788.7 mg/kg bw/d
Toxic Response/effects by Dose Level	Elevated liver weights at 1.0 and 5.0% polyterpene
Statistical Evaluation	Yes, *alpha* = 0.05 and 0.01
Remarks for Results	No differences were seen between the test and control animals for the following parameters: growth, food consumption and utilization, mortality, hematologic and urine analyses, gross pathologic findings and histopathological findings. Elevated liver weights were reported for the two highest-level treatment groups. One male from the 0.05% and one male from the 1.0% test groups died during the study. These deaths were attributed to respiratory illness.
Conclusion Remarks	Statistically significant differences in liver weights were reported for the two highest treatment groups. Histopathological examination revealed no differences. Under the conditions of this study, the NOAEL is considered to be 116.5 mg/kg bw/d.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	There was no quantitative data on the concentration of the monomer *beta*-pinene in the polymeric resin. Therefore, the study is considered unreliable.
References	Calandra J. C. (1962) Ninety-day subacute oral toxicity of polyterpene - albino rats. Industrial Bio-Test Laboratories, Inc. Unpublished report.

Substance Name	Camphene
CAS No.	79-92-5
Method/guideline	OECD Guideline 407
GLP	Yes
Year	1991
Species/strain	Rat/Wistar
Sex	Male and Female
Route of Administration	Gavage
Doses/concentration Levels	0, 62.5, 250, 1000 mg/kg bw/d in sesame oil
Exposure Period	28 days
Frequency of Treatment	Daily
Control Group	Yes
Post Exposure Observation Period	None

Remarks for Test Conditions	5 sex/group
NOAEL (NOEL)	250 mg/kg bw/day (F); <62.5 mg/kg bw/day (M)
LOAEL (LOEL)	1000 mg/kg bw/day
Toxic Response/effects by Dose Level	Increased liver weights at 1000 mg/kg bw/day in both sexes. *alpha*-2-microglobulin nephrotoxicity in males only at all dose levels. Nephrotoxicity effect no relevant to humans.
Statistical Evaluation	Yes
Remarks for Results	In the highest dose group of both sexes, an increase in saliva flow, vacuolization of hepatocytes and elevated liver weights were reported. Male animals exhibited dose dependent deposit in epithelia of the proximal tubules as well as single cell necrosis. The sex-and species-specific nephrotoxic effects have been described for other substances as *alpha*-2-microglobulin nephrotoxicity. The NOEL is 250 mg/kg bw/day for females and <62.5 mg/kg bw/day for males based on the observed nephrotoxicity.
Conclusion Remarks	The NOEL is 250 mg/kg bw/day
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The study was performed according to OECD Guideline 407.
References	Hoechst AG (1991f) Unveröffentl. Unters. (Ber.-Nr. 91.0475)

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine
Method/guideline	30 day sub-acute vapor inhalation
GLP	None
Year	1964
Species/strain	Mice/Swiss white
Sex	Female
Route of Administration	Inhalation
Doses/concentration Levels	2400 mg/m3
Exposure Period	30 days
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None

Remarks for Test Conditions	Twenty Swiss white mice (10 male and 10 female) were exposed to 2.4 mg/L turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for thirty days. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 7, 14, 21 and 30 days during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation and at the conclusion of the study. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart, trachea, adrenal glands and mesenteric lymph nodes were performed on three males and three females.
LOAEL (LOEL)	2400 mg/m3
Actual Dose Received by Dose Level and Sex	Not determined
Toxic Response/effects by Dose Level	Generalized inactivity during daily exposure to turpentine vapor.
Statistical Evaluation	None
Remarks for Results	Generalized inactivity during daily exposure to turpentine vapor was reported for all animals in the study. No other effects on mortality, body weight, hematologic parameters, gross or histopathological parameters were reported.
Conclusion Remarks	Generalized inactivity during the treatment was reported for Swiss mice exposed to 2400 mg/m3 of turpentine for six hours a day, five days a week for thirty days.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.
References	Calandra J. C. (1964) 30-Day subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine
Method/guideline	30 day sub-acute vapor inhalation
GLP	No
Year	1964
Species/strain	Rats/Long-Evans hooded
Sex	Female

Route of Administration	Inhalation
Doses/concentration Levels	2400 mg/m3
Exposure Period	30 days
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None
Remarks for Test Conditions	Twenty Long-Evans hooded rats (10 male and 10 female) were exposed to 2400 mg/m3 turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for thirty days. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 7, 14, 21 and 30 days during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation and at the conclusion of the study. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart, trachea, adrenal glands and mesenteric lymph nodes were performed on three males and three females.
LOAEL (LOEL)	2400 mg/m3
Actual Dose Received by Dose Level and Sex	Not determined
Toxic Response/effects by Dose Level	Generalized inactivity during daily exposure to turpentine vapor
Remarks for Results	Generalized inactivity during daily exposure to turpentine vapor was reported for all animals in the study. No other effects on mortality, body weight, hematologic parameters, gross or histopathological parameters were reported.
Conclusion Remarks	Generalized inactivity during the treatment was reported for Long-Evans hooded rats exposed to 2400 mg/m3 of turpentine for six hours a day, five days a week for thirty days.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.
References	Calandra J. C. (1964) 30-Day subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine

Method/guideline	90 day sub-acute vapor inhalation
GLP	No
Year	1963
Species/strain	Guinea pigs/English strain
Sex	Male and Female
Route of Administration	Inhalation
Doses/concentration Levels	4800 mg/m3
Exposure Period	12 weeks
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None
Remarks for Test Conditions	Ten (5 male and 5 female) English strain guinea pigs were exposed to 4.8 mg/L turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for twelve weeks. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 2, 4, 8, 12 weeks during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation, at one month and at 12 weeks. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart and trachea were performed.
NOAEL (NOEL)	Not available
LOAEL (LOEL)	4800 mg/m3
Actual Dose Received by Dose Level and Sex	4800 mg/m3 determined by gas chromatography
Toxic Response/effects by Dose Level	None attributed to administration of test material.
Statistical Evaluation	None
Remarks for Results	No growth effects were reported. No deaths were reported. Generalized inactivity was reported for the duration of the study for both sexes. No differences in hematologic values were reported when compared to the pre-test values. Necropsies of the test animals revealed no gross pathological changes, which were related to subacute inhalation of turpentine vapor. Histopathological examination did not reveal any changes which were related to subacute inhalation of turpentine vapor.
Conclusion Remarks	Generalized inactivity was reported for male and female guinea pigs exposed to 4.8 mg/L of turpentine for six hours a day, five days a week for twelve days a week.

Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.
References	Kay J. H. (1963) Subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine oil
Method/guideline	90 day sub-acute vapor inhalation
GLP	No
Year	1963
Species/strain	Rat/Sprague-Dawley
Sex	Male and Female
Route of Administration	Inhalation
Doses/concentration Levels	4800 mg/m3
Exposure Period	12 weeks
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None
Remarks for Test Conditions	Twenty-five Sprague Dawley albino rats (10 male and 15 female) were exposed to 4800 mg/m3 turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for twelve weeks. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 2, 4, 8, 12 weeks during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation, at one month and at 12 weeks. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart and trachea were performed.
NOAEL (NOEL)	Not available
LOAEL (LOEL)	4800 mg/m3

Actual Dose Received by Dose Level and Sex	Not determined
Toxic Response/effects by Dose Level	Adverse body weight gain was reported in the female rats. All female rats died within 23 days of the study inception. No effects on mortality were reported for the male rats. Male rats exhibited generalized inactivity during exposure to the vapor throughout the study, while female rats were reported to have experienced generalized inactivity during the first few days of exposure. Later in the study mild to moderate sedation was reported, until severe sedation terminated by death was reported in the female rats.
Statistical Evaluation	None
Remarks for Results	Adverse body weight gain was reported in the female rats. All female rats died within 23 days of the study inception. No effects on mortality were reported for the male rats. Male rats exhibited generalized inactivity during exposure to the vapor throughout the study, while female rats were reported to have experienced generalized inactivity during the first few days of exposure. Later in the study mild to moderate sedation was reported, until severe sedation terminated by death was reported in the female rats. No differences in hematologic values were reported when compared to the pre-test values. Necropsies of the male test animals revealed no gross pathological changes, which were related to subacute inhalation of turpentine vapor. Necropsies of the female test animals revealed severe congestion of the lungs and the absence or incomplete clotting of blood. Histopathological examination did not reveal any changes that were related to subacute inhalation of turpentine vapor in the male rats. Histopathological examination of ten female rats revealed significant changes in the heart and lung, characterized by acute terminal pulmonary hyperemia and edema and acute myocardial anoxic changes. The cause of death of the animals was attributed to cardio-respiratory insufficiency with associated acute myocardial anoxia.
Conclusion Remarks	Depressed weight gain, increased mortality, gross and histopathological changes in the female rats was attributed to exposure of the animals to the test material for six hours a day, five days a week for twelve weeks.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.
References	Kay J. H. (1963) Subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine

Method/guideline	30 day sub-acute vapor inhalation
GLP	No
Year	1964
Species/strain	Rats/Sprague-Dawley
Sex	Female
Route of Administration	Inhalation
Doses/concentration Levels	2400 mg/m3
Exposure Period	30 days
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None
Remarks for Test Conditions	Ten Sprague Dawley female albino rats were exposed to 2400 mg/m3 turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for thirty days. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 7, 14, 21 and 30 days during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation and at the conclusion of the study. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart, trachea, adrenal glands and mesenteric lymph nodes were performed on all of the albino rats.
LOAEL (LOEL)	2400 mg/m3
Actual Dose Received by Dose Level and Sex	Not determined
Toxic Response/effects by Dose Level	Generalized inactivity during daily exposure to turpentine vapor.
Statistical Evaluation	None
Remarks for Results	Generalized inactivity during daily exposure to turpentine vapor was reported for all animals in the study. No other effects on mortality, body weight, hematologic parameters, gross or histopathological parameters were reported.
Conclusion Remarks	Generalized inactivity during the treatment was reported for Sprague-Dawley rats exposed to 2400 mg/m3 of turpentine for six hours a day, five days a week for thirty days.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.

References	Calandra J. C. (1964) 30-Day subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

Substance Name	Turpentine oil
CAS No.	8006-64-2
Remarks for Substance	Test substance was turpentine oil
Method/guideline	90-day sub-acute vapor inhalation
GLP	No
Year	1964
Species/strain	Dog/Beagle
Sex	Male and Female
Route of Administration	Inhalation
Doses/concentration Levels	4.8 mg/L (4800 mg/m3)
Exposure Period	12 weeks
Frequency of Treatment	Six hours\day, five days a week
Control Group	None
Post Exposure Observation Period	None
Remarks for Test Conditions	Two Beagle dogs (male and female) were exposed to 4800 mg/m3 turpentine vapor, determined by gas chromatograph, for six hours each day, five days per week, for twelve weeks. Food and water were provided ad libitum for the duration of the study. Body weights were recorded at the onset of the study, and at 2, 4, 8, 12 weeks during the study. Mortality and abnormal behavioral reactions were recorded daily. Hematologic studies, hemoglobin concentration, erythrocyte count, both total and differential leukocyte counts, were conducted before study initiation, at one month and at 12 weeks. Necropsies were performed on all animals dying during the study and all animals surviving until the end of the study period. Histopathologic examination of the lung, kidney, liver, heart and trachea were performed.
NOAEL (NOEL)	Not available
LOAEL (LOEL)	4800 mg/m3
Actual Dose Received by Dose Level and Sex	Not determined
Toxic Response/effects by Dose Level	Slight ataxia and generalized inactivity was reported for both sexes during the exposure period
Statistical Evaluation	None

Remarks for Results	No growth effects were reported. No deaths were reported. Slight ataxia was reported for both sexes for the first three days of the study during the exposure period. Generalized inactivity was reported for the remainder of the study for both sexes. No differences in hematologic values were reported when compared to the pre-test values. Necropsies of the test animals revealed no gross pathological changes, which were related to subacute inhalation of turpentine vapor. Histopathological examination did not reveal any changes which were related to subacute inhalation of turpentine vapor.
Conclusion Remarks	Slight ataxia and generalized inactivity was reported for a male and female beagle dog exposed to 4800 mg/m3 of turpentine for six hours a day, five days a week for twelve days a week.
Data Qualities Reliabilities	Reliability code 3. Not reliable.
Remarks for Data Reliability	This study, conducted prior to GLP, is not considered reliable due to the lack of controls, and single dose design. The results are difficult to interpret due to the lack of controls.
References	Kay J. H. (1963) Subacute vapor inhalation toxicity of turpentine. Industrial Bio-Test Laboratories, Inc., Unpublished report.

4.4 Reproductive Toxicity

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), *beta*-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	One generation reproduction study
GLP	No
Year	1973
Species/Strain	Mouse/CD-1 outbred
Sex	Female
Route of Administration	Oral (gavage)
Duration of Test	Days 6 to 15 of gestation
Doses/Concentration	0(control), 6, 26, 120, 560 mg/kg bw/day and a positive control of 150 mg/kg bw/day of aspirin.

Premating Exposure period for males	None
Premating Exposure period for females	None
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 150 mg/kg bw/day of aspirin in corn oil.
Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the reproductive segment of the study, virgin adult female CD-1 outbred mice were gang-housed in plastic disposable cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated with untreated young adult males and observation of vaginal sperm plugs was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 15 of gestation, females were given 0, 6, 26, 120, or 560 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received 150 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 6, 11, 15, and 17 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 17 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported. The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects.
NOAEL(NOEL)	560 mg/kg bw/day
Actual dose received by dose level and sex	560 mg/kg bw/day
Parental data and F1 as Appropriate	Data for number of females mated/pregnant at each dose level: 0 mg/kg bw, 24/21; 150 mg/kg bw of aspirin, 30/20; 6 mg/kg bw, 30/22; 26 mg/kg bw, 31/21; 120 mg/kg bw, 22/21; 560 mg/kg bw, 32/20. All pregnant females survived to sacrifice on Day 17. There was no significant difference in dam body weights between controls and any test group measured at Days 0, 6, 11, 15, or 17 of the study. None of the pregnant females died or aborted before Day 17and all litters were alive on Day 17 sacrifice. Average number of corpora lutea/dam mated were similar for controls and treatment groups: 0 mg/kg bw, 12.5; 150 mg/kg bw aspirin, 12.0; 6 mg/kg bw, 12.3; 26 mg/kg bw, 11.2; 120 mg/kg bw, 12.9; 560 mg/kg bw, 11.2. The average number of implantation sites/dam and % partial resorptions were similar for all groups:0 mg/kg bw, 11.8 and 19%; 150 mg/kg bw aspirin, 11.3 and 45%; 6 mg/kg bw, 12.5 and 45%; 26 mg/kg bw, 11.9 and 28%; 120 mg/kg bw, 10.5 and 28%; 560

	mg/kg bw, 11.0 and 25%. Based on bodyweight changes, clinical observation, and gross examination of the urogenital tract, was no evidence of toxicity to dams.
Offspring Toxicity F1 and F2	Based on gross examination of live pups, visceral examination and skeletal examination there were no signs of toxicity to offspring. The total number of live fetuses, average number of live fetuses per dam, sex ratio, number of dead fetuses, and average fetal weight were not different between control and treatment groups. Total number of live fetuses/dead fetuses/average fetal weight are recorded below: 0 mg/kg bw, 240/3/0.88g; 150 mg/kg bw aspirin, 207/2/0.80g; 6 mg/kg bw, 253/0/0.87g; 26 mg/kg bw, 242/1/0.87g; 120 mg/kg bw, 210/3/0.87g; 560 mg/kg bw, 206/5/0.81g.
Conclusion Remarks	The administration of up to and including 560 mg/kg bw/day of test article FDA 71-28 to pregnant mice on days 6 through 15 of gestation had no effects on nidation, maternal survival or fetal survival. The number and types of abnormalities seen in tissues of the dam or pups of the test groups did not differ for the number and type occurring spontaneously in the positive or negative controls.
Data Reliabilities Qualities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973a) Teratologic evaluation of FDA 71-28 in mice. Contract No. FDA 71-260. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), *beta*-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	One generation reproduction study
GLP	No
Year	1973
Species/Strain	Hamster/adult golden
Sex	Female
Route of Administration	Oral (gavage)
Duration of Test	Days 6 to 15 of gestation
Doses/Concentration	0(control), 6, 28, 130, or 600 mg/kg bw/day and a positive control of 250 mg/kg bw/day of aspirin.

Premating Exposure period for males	None
Premating Exposure period for females	None
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 250 mg/kg bw/day of aspirin in corn oil.
Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the reproductive segment of the study, groups (26-28/dose/group) of virgin adult female hamster were individually housed in mess-bottom cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated one to one with untreated adult males and the appearance of motile sperm in the vaginal sperm was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 10 of gestation, females were given 0, 6, 28, 130, or 600 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received 250 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 8, 10, and 14 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 14 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported. The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects.
NOAEL(NOEL)	600 mg/kg bw/day
Actual dose received by dose level and sex	600 mg/kg bw/day
Parental data and F1 as Appropriate	Data for number of females mated/pregnant at each dose level: 0 mg/kg bw, 27/21; 250 mg/kg bw of aspirin, 26/19; 6 mg/kg bw, 28/19; 28 mg/kg bw, 26/21; 130 mg/kg bw, 28/20; 600 mg/kg bw, 27/23. All pregnant females survived to sacrifice on Day 14. There was no significant difference in dam body weights between controls and any test group measured at Days 0, 6, 8, 10, or 14 of the study. One death each was reported in the two control groups and in the two highest dose groups before day 14. All litters were alive on Day 14 sacrifice. Average number of corpora lutea/dam mated were similar for controls and treatment groups: 0 mg/kg bw, 10.3; 250 mg/kg bw aspirin, 9.9; 6 mg/kg bw, 9.6; 28 mg/kg bw, 11.4; 130 mg/kg bw, 9.6; 600 mg/kg bw, 11.2. The average number of implantation sites/dam and % partial resorptions were similar for all groups:0 mg/kg bw, 11.7 and 15%; 250 mg/kg bw aspirin, 11.3 and 39%; 6 mg/kg bw, 12.1 and 32%; 28 mg/kg bw, 11.9

	and 38%; 130 mg/kg bw, 11.5 and 42%; 600 mg/kg bw, 12.1 and 23%. Based on bodyweight changes, clinical observation, and gross examination of the urogenital tract, was no evidence of toxicity to dams.
Offspring Toxicity F1 and F2	Based on gross examination of live pups, visceral examination, and skeletal examination there were no signs of toxicity to offspring in either the control or test groups. The total number of live fetuses, average number of live fetuses per dam, sex ratio, and average fetal weight were not different between control and treatment groups. A small number of dead fetuses were reported at the three highest dose levels. The incidence of mortality was not dose related. Total number of live fetuses/dead fetuses/average fetal weight are recorded below: 0 mg/kg bw, 229/0/1.76g; 250 mg/kg bw aspirin, 192/0/1.74g; 6 mg/kg bw, 217/0/1.66g; 28 mg/kg bw, 230/7/1.73g; 130 mg/kg bw, 195/5/1.72g; 600 mg/kg bw, 258/1/1.70g.
Conclusion Remarks	The administration of up to and including 600 mg/kg bw/day of test article FDA 71-28 to pregnant golden hamsters on days 6 through 10 of gestation had no effects on nidation, maternal survival or fetal survival. The number and types of abnormalities seen in tissues of the dam or pups of the test groups did not differ for the number and type occurring spontaneously in the positive or negative controls.
Data Reliabilities Qualities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973b) Teratologic evaluation of FDA 71-28 in hamsters. Contract No. FDA 71-260. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), *beta*-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	One generation reproduction study
GLP	No
Year	1973
Species/Strain	Rat/Wistar adult
Sex	Female
Route of Administration	Oral (gavage)

Duration of Test	Day 14 of gestation
Doses/Concentration	0(control), 3, 12, 56, or 260 mg/kg bw/day and a positive control of 250 mg/kg bw/day of aspirin.
Premating Exposure period for males	None
Premating Exposure period for females	None
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 250 mg/kg bw/day of aspirin in corn oil.
Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the reproductive segment of the study, virgin adult female Wistar were individually housed in mess-bottom cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated with untreated young adult males and observation of vaginal sperm plugs was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 15 of gestation, females were given 0, 3, 2, 56, or 260 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received 250 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 6, 11, 15, and 20 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 20 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported. The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects.
NOAEL(NOEL)	260 mg/kg bw/day
Actual dose received by dose level and sex	260 mg/kg bw/day
Parental data and F1 as Appropriate	Data for number of females mated/pregnant at each dose level: 0 mg/kg bw, 25/23; 250 mg/kg bw of aspirin, 25/22; 3 mg/kg bw, 25/25; 12 mg/kg bw, 25/23; 56 mg/kg bw, 25/22; 260 mg/kg bw, 25/21. All pregnant females survived to sacrifice on Day 20. There was no significant difference in dam body weights between controls and any test group measured at Days 0, 6, 11, 15, or 20 of the study. None of the pregnant females died or aborted before Day 20 and all litters were alive on Day 20 sacrifice. Average number of corpora lutea/dam mated were similar for controls and treatment groups: 0 mg/kg bw, 12.8; 250 mg/kg bw aspirin, 11.1; 3 mg/kg bw, 12.7; 12 mg/kg bw,12.5; 56 mg/kg bw, 11.6; 260 mg/kg bw,10.7. The average number of implantation sites/dam and % partial resorptions

	were similar for all groups:0 mg/kg bw, 11.9 and 9%; 250 mg/kg bw aspirin, 11.1 and 32%; 3 mg/kg bw, 12 and 12%; 12 mg/kg bw, 11.8 and 4%; 56 mg/kg bw, 11.1 and 5%; 260 mg/kg bw, 11.1 and 5%. Based on bodyweight changes, clinical observation, and gross examination of the urogenital tract, there was no evidence of toxicity to dams.
Offspring Toxicity F1 and F2	Based on gross examination of live pups, visceral examination and skeletal examination there were no signs of toxicity to offspring in either the control or test groups. The total number of live fetuses, average number of live fetuses per dam, sex ratio, number of dead fetuses, and average fetal weight were not different between control and treatment groups. Total number of live fetuses/dead fetuses/ average fetal weight are recorded below: 0 mg/kg bw, 270/1/3.70g; 250 mg/kg bw aspirin, 216/2/2.68g; 3 mg/kg bw, 295/1/3.91g; 12 mg/kg bw, 271/0/3.73g; 56 mg/kg bw, 242/1/3.95g; 260 mg/kg bw, 230/0/3.76g.
Conclusion Remarks	The administration of up to and including 260 mg/kg bw/day of test article FDA 71-28 to pregnant Wistar rats on days 6 through 15 of gestation had no effects on nidation, maternal survival or fetal survival. The number and types of abnormalities seen in tissues of the dam or pups of the test groups did not differ for the number and type occurring spontaneously in the positive or negative controls.
Data Reliabilities Qualities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973c) Teratologic evaluation of FDA 71-28 in rats. Contract No. FDA 71-260. Unpublished Report.

4.5 Developmental/Teratogenicity Toxicity

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), beta-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	Teratology study
GLP	Pre-GLP
Year	1973
Species/strain	Mouse/CD-1 outbred

Sex	Female
Route of Administration	Gavage
Duration of Test	10 days
Doses/concentration Levels	0(control), 6, 26, 120, 560 mg/kg bw/day and a positive control of 150 mg/kg bw/day of aspirin
Exposure Period	Days 6 to 15 of gestation
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 150 mg/kg bw/day of aspirin in corn oil
Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the study, virgin adult female CD-1 outbred mice were gang-housed in plastic disposable cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated with untreated young adult males and observation of vaginal sperm plugs was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 15 of gestation, groups (20-22/group) of pregnant females were given 0, 6, 26, 120, or 560 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received 150 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 6, 11, 15, and 17 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 17 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported (these data were described in the robust summary for reproductive effects for the test material). The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects (the maternal and developmental fetal effects are discussed in this robust summary).
NOAEL (NOEL) maternal toxicity	560 mg/kg bw/day
NOAEL (NOEL) developmental toxicity	560 mg/kg bw/day
Actual dose received by dose level and sex	0, 6, 26, 120, or 560 mg/kg bw of the test material (FDA 71-28)
Maternal data with dose level	Daily clinical observation and measurement of body weight gain failed to show any differences between control and test groups of female mice. The number pregnant and % pregnancy were similar for all dose and control groups. No abortions were observed in any group.

Fetal Data with Dose Level	The average fetal weight of treatment and control groups were not statistically different (p>0.05). The total number of live fetuses was similar for test and control groups. Also, there was no significant difference in the number of dead fetuses between test and control groups. Skeletal examination of sternebrae showed no significant differences in the incidence of incomplete ossification or missing sternebrae for test and control groups. Likewise the incidences of fetuses with more than 13 ribs, incomplete ossification of vertebrae and extremities, incomplete skull closures were similar for test and control animals. Visceral examination failed to reveal any evidence of abnormalities at any dose level.
Conclusion Remarks	There was no evidence of maternal toxicity or developmental toxicity at dose levels up to and including 560 mg/kg bw/day of test material.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973a) Teratologic evaluation of FDA 71-28 in mice. Contract No. FDA 71-260. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), beta-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	Teratology study
GLP	Pre-GLP
Year	1973
Species/strain	Rat/Wistar adult
Sex	Female
Route of Administration	Gavage
Duration of Test	10 days
Doses/concentration Levels	0(control), 3, 12, 56, 260 mg/kg bw/day and a positive control of 250 mg/kg bw/day of aspirin
Exposure Period	Days 6 to 15 of gestation
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 250 mg/kg bw/day of aspirin in corn oil

Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the study, virgin adult female rats were individually housed in mess bottom cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated with untreated young adult males and observation of vaginal sperm plugs was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 15 of gestation, groups (21-25/group) of pregnant females were given 0, 6, 26, 120, or 260 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received 250 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 6, 11, 15, and 20 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 20 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported (these data were described in the robust summary for reproductive effects for the test material). The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects (the maternal and developmental fetal effects are discussed in this robust summary).
NOAEL (NOEL) maternal toxicity	260 mg/kg bw/day
NOAEL (NOEL) developmental toxicity	260 mg/kg bw/day
Actual dose received by dose level and sex	0, 3, 12, 56, or 260 mg/kg bw of the test material (FDA 71-28)
Maternal data with dose level	Daily clinical observation and measurement of body weight gain failed to show any differences between control and test groups of female rats. The number pregnant and % pregnancy were similar for all dose and control groups. No abortions were observed in any group.
Fetal Data with Dose Level	The average fetal weight of treatment and control groups were not statistically different ($p>0.05$). The total number of live fetuses was similar for test and control groups. Also, there was no significant difference in the number of dead fetuses between test and control groups. Except for positive control group, skeletal examination of sternebrae showed no significant differences in the incidence of incomplete ossification or missing sternebrae for test and untreated control group. Likewise the incidences of fetuses with more than 13 ribs, incomplete ossification of vertebrae and extremities, incomplete skull closure were similar for test and the untreated control group except for the positive aspirin-treated control group in which increases in incidences of these skeletal effects were observed. Visceral examination failed to reveal any evidence of

	abnormalities at any dose level.
Conclusion Remarks	There was no evidence of maternal toxicity or developmental toxicity at dose levels up to and including 260 mg/kg bw/day of test material.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973c) Teratologic evaluation of FDA 71-28 in rats. Contract No. FDA 71-260. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	Test material a mixture of 85-90% terpene hydrocarbons and < 10% oxygenated terpene hydrocarbons. The major bicyclic terpene hydrocarbon constituents of the formula C10H16 are *alpha*-pinene (20-25%), beta-pinene (15-18%) and sabinene (38-42%). Sabinene is 2-methylenebicyclo[3.1.0]hexane, 5-isopropyl- and beta-pinene is 2-methylenebicyclo[3.1.1]heptane, 2,6,6-trimethyl-.
Test Type	Teratology study
GLP	Pre-GLP
Year	1973
Species/strain	Hamster/golden
Sex	Female
Route of Administration	Gavage
Duration of Test	5 days
Doses/concentration Levels	0(control), 6, 28, 130, 600 mg/kg bw/day and a positive control of 250 mg/kg bw/day of aspirin
Exposure Period	Days 6 to 15 of gestation
Frequency of Treatment	Daily
Control Group and Treatment	Control group received corn oil vehicle (10 ml//kg); Positive control received 250 mg/kg bw/day of aspirin in corn oil
Remarks for Test Conditions	Study measured parameters for reproductive and developmental toxicity. In the study, virgin adult female hamsters were individually housed in mess bottom cages in a temperature- and humidity-controlled room. Animals were given free access to food and fresh tap water. There were mated one to one with untreated young adult males and the appearance of motile sperm in the vaginal sperm was considered day 0 of gestation. Beginning on Day 6 and continuing daily through Day 10 of gestation, groups (19-23/group) of pregnant females were given 0, 6, 28, 130, or 600 mg/kg bw of the test material (FDA 71-28) by gavage in corn oil. A positive control group received

	250 mg/kg bw/day of aspirin. Body weights were recorded on days 0, 6, 8, 10, and 14 of gestation. Females were observed daily for appearance and behavior. Food consumption and body weight were monitored to eliminate any abnormalities that may be associated with anorexia in pregnant females. On Day 14 all dams were subjected to Caesarian section and the number of implantation sites, resorption sites, live fetuses, dead fetuses, and body weight of live pups were recorded. Gestation index, mortality, gross pathology incidence of the dam urogenital tract, number of implantation sites, number of corpora lutea, litter size and weights, sex and sex ratio of pups, and gross abnormalities to pups were reported (these data were described in the robust summary for reproductive effects for the test material). The urogenital tract of each dam was examined for anatomical abnormalities. One-third of fetuses of each litter underwent detailed visceral examination at 10x magnification. The remaining two-thirds were stained with alizarin red S dye/KOH and examined for skeletal defects (the maternal and developmental fetal effects are discussed in this robust summary).
NOAEL (NOEL) maternal toxicity	600 mg/kg bw/day
NOAEL (NOEL) developmental toxicity	600 mg/kg bw/day
Actual dose received by dose level and sex	0, 6, 28, 130, or 600 mg/kg bw of the test material (FDA 71-28)
Maternal data with dose level	Daily clinical observation and measurement of body weight gain failed to show any differences between control and test groups of female rats. The number pregnant and % pregnancy were similar for all dose and control groups. One pregnant female died in each of the two control groups and the two highest dose groups in the study. No abortions were observed in any group.
Fetal Data with Dose Level	The average fetal weight of treatment and control groups were not statistically different ($p>0.05$). The total number of live fetuses was similar for test and control groups. A small % of (less than 3%) dead fetuses were observed at the three highest dose levels. Skeletal examination of sternebrae showed no significant differences in the incidence of incomplete ossification or missing sternebrae for test and control groups. Likewise the incidences of fetuses with more than 13 ribs, incomplete ossification of vertebrae and extremities, incomplete skull closures were similar for test and control animals. Visceral examination failed to reveal any evidence of abnormalities at any dose level.
Conclusion Remarks	There was no evidence of maternal toxicity or developmental toxicity at dose levels up to and including 600 mg/kg bw/day of test material.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Code 2. Acceptable, well-documented publication/study report, which meets basic scientific principles.
References	Morgareidge K. (1973b) Teratologic evaluation of FDA 71-28 in hamsters. Contract No. FDA 71-260. Unpublished Report.

Substance Name	*alpha*-Pinene
CAS No.	80-56-8
Remarks for Substance	The test substance was rowachol which is a terpene mixture and contains *alpha*/*beta*-pinene (17%), l-menthol (32%), menthone (6%), borneol (5%), d-camphene (5%), cineol (2%), rheochrysin(0.1%). The vehicle was olive oil (32.9%).
Method/guideline	In vivo teratology toxicity screening test
Test Type	In vivo mammalian test system
GLP	Pre-GLP
Year	1978
Species/strain	Rat/Sprague-Dawley
Sex	Female
Route of Administration	Oral (gavage)
Duration of Test	20 days
Doses/concentration Levels	0, 0.16, 0.8, 1.6 ml/kg (0, 137.6, 688, 860 mg/kg)
Exposure Period	5 days
Frequency of Treatment	Daily
Control Group and Treatment	0.8 ml/kg (688 mg/kg) olive oil
Remarks for Test Conditions	The test substance was administered orally by gavage at the dose levels specified or the vehicle alone once daily for six days from the 9th to 14th day of gestation. All dams were necropsied and examined for gross lesions on Day 20.
NOAEL (NOEL) maternal toxicity	0.8 ml/kg (688 mg/kg)
LOAEL (LOEL) maternal toxicity	1.6 ml/kg (860 mg/kg)
NOAEL (NOEL) developmental toxicity	0.8 ml/kg (688 mg/kg)
LOAEL (LOEL) developmental toxicity	1.6 ml/kg (860 mg/kg)
Maternal data with dose level	No significant differences were reported for maternal body weight gain, number of implantations, placental weight, intrauterine mortality and fetal weight for the 0.16 (137.6 mg/kg) and 0.8 ml/kg (688 mg/kg) dose levels. At the 1.6 ml/kg (860 mg/kg) dose level, significant maternal weight loss and placental and fetal weight loss were reported.
Fetal Data with Dose Level	No gross, visceral or skeletal anomalies were reported at the highest dose level. Malformations were reported in the 0.16 ml/kg (137.6 mg/kg) dose group and the control group, but the differences between the two were not significant. No effect on postnatal development was reported for the 0.16 (137.6 mg/kg) and 0.8 ml/kg (688 mg/kg) dose levels. Newborn body weight showed significant decrease at the 1.60 ml/kg (860 mg/kg)

	dose level, but development recovered within one week.
Statistical Evaluation	Yes
Remarks for Results	Given the recovery of the newborn body weight, the authors concluded there were no teratogenic effects of the test substance at any of the dose levels administered to rats.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Comparable to guideline study with acceptable restrictions. Data were acquired prior to GLP or OECD guidelines but were obtained by standard methodology and published in a peer reviewed journal.
References	Hasegawa M. and T. Toda (1978) Teratological studies on rowachol. Oyo Yakuri, 15(7), 1109-1119.

Substance Name	*beta*-Pinene
CAS No.	127-91-3
Remarks for Substance	The test substance was rowachol which is a terpene mixture and contains *alpha*/*beta*-pinene (17%), l-menthol (32%), menthone (6%), borneol (5%), d-camphene (5%), cineol (2%), rheochrysin(0.1%). The vehicle was olive oil (32.9%).
Method/guideline	In vivo teratological toxicity screening test
Test Type	In vivo mammalian test system
GLP	Pre-GLP
Year	1978
Species/strain	Rat/Sprague-Dawley
Sex	Female
Route of Administration	Oral
Duration of Test	20 days
Doses/concentration Levels	0, 0.16, 0.8, 1.6 ml/kg (0, 137.6, 688, 860 mg/kg)
Exposure Period	5 days
Frequency of Treatment	Daily
Control Group and Treatment	0.8 ml/kg (688 mg/kg) olive oil
Remarks for Test Conditions	The test substance was administered orally at the dose levels specified or the vehicle alone once daily for six days from the 9th to 14th day of gestation. All dams were necropsied and examined for gross lesions on Day 20.
NOAEL (NOEL) maternal toxicity	0.8 ml/kg (688 mg/kg)
LOAEL (LOEL) maternal toxicity	1.6 ml/kg (860 mg/kg)

NOAEL (NOEL) developmental toxicity	0.8 ml/kg (688 mg/kg)
LOAEL (LOEL) developmental toxicity	1.6 ml/kg (860 mg/kg)
Maternal data with dose level	No significant differences were reported for maternal body weight gain, number of implantations, placental weight, intrauterine mortality and fetal weight for the 0.16 (137.6 mg/kg) and 0.8 ml/kg (688 mg/kg) dose levels. At the 1.6 ml/kg (860 mg/kg) dose level, significant maternal weight loss and placental and fetal weight loss were reported.
Fetal Data with Dose Level	No gross, visceral or skeletal anomalies were reported at the highest dose level. Malformations were reported in the 0.16 ml/kg (137.6 mg/kg) dose group and the control group, but the differences between the two were not significant. No effect on postnatal development was reported for the 0.16 (137.6 mg/kg) and 0.8 ml/kg (688 mg/kg) dose levels. Newborn body weight showed significant decrease at the 1.60 ml/kg (860 mg/kg) dose level, but development recovered within one week.
Statistical Evaluation	Yes
Remarks for Results	Given the recovery of the newborn body weight, the authors concluded there were no teratogenic effects of the test substance at any of the dose levels administered to rats.
Data Qualities Reliabilities	Reliability code 2. Reliable with restrictions.
Remarks for Data Reliability	Comparable to guideline study with acceptable restrictions. Data were acquired prior to GLP or OECD guidelines but were obtained by standard methodology and published in a peer reviewed journal
References	Hasegawa M. and T. Toda (1978) Teratological studies on rowachol. Oyo Yakuri, 15(7), 1109-1119.

Substance Name	Camphene
CAS No.	79-92-5
Remarks for Substance	Camphene (78%)
Method/guideline	OECD Guideline 414
GLP	Yes
Year	1992
Species/strain	Rat/Sprague-Dawley
Sex	Female
Route of Administration	Gavage
Doses/concentration Levels	0, 250, 1000 mg/kg bw/day
Exposure Period	Days 6 to 15 of gestation
Frequency of Treatment	Daily

Control Group and Treatment	Yes, concurrent, no treatment
Remarks for Test Conditions	20 animals/group
NOAEL (NOEL) maternal toxicity	250 mg/kg bw
NOAEL (NOEL) developmental toxicity	1000 mg/kg bw
Remarks for Results	No maternal mortalities were reported at any dose level. Clinical symptoms include reduced motor activity and salivation in 6 of 20 dams in the high dose group after the first or second dose. At 1000 mg/kg bw, there was a slight but not statistically significant increase (11.5%) in resorption rate compared to the control group (5.2%). No teratogenic effects were observed in any dose group.
Data Qualities Reliabilities	Reliability code 1. Reliable without restrictions.
Remarks for Data Reliability	The study was performed according to OECD Guideline 414.
References	Hoechst AG (1992) LPT Laboratory of Pharmacology and Toxicology, Report No. 7263/92 (HOE 92.1167) and Report No. 7114/91.